7 JANUARY 1954

NINEPENCE

ELECTRICAL TIMES

FOR HOT INSTALLATIONS

BICC SILICONE RUBBER INSULATED CABLES

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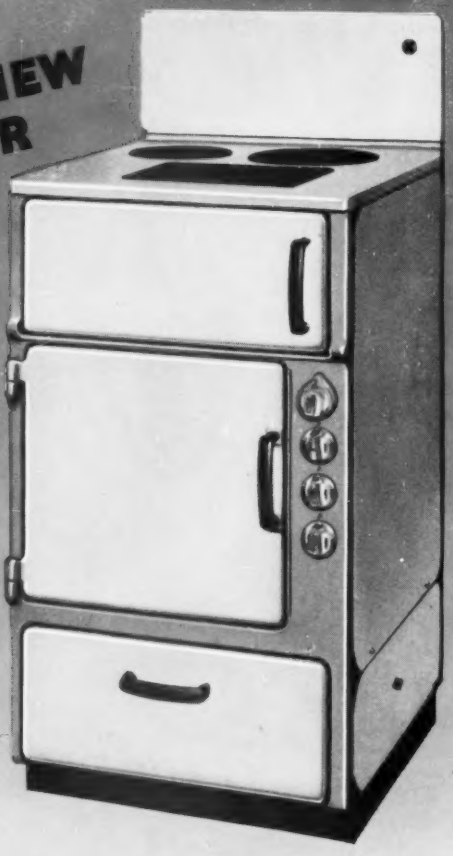
Send for publication No. 261

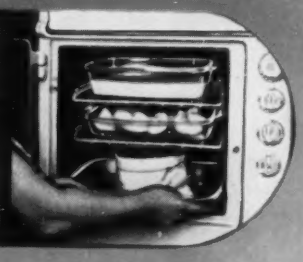
B N E

MODEL C.51

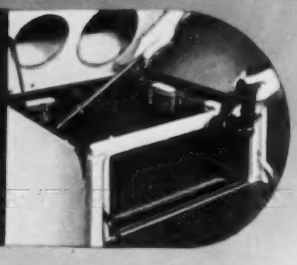
AN OUTSTANDING NEW LOW COST COOKER



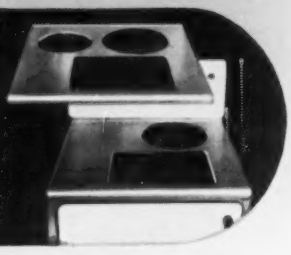
A full-size oven (2,600 cub. ins. actual cooking space) makes the C. 51 suitable for all but the largest of families.



The hotcupboard gives ample warming space, and is designed for easy cleaning.



Interchangeable 2-plate and 3-plate hobs mean that only one type of cooker need be stocked. Ideal for housing authorities.



The B.N.E. Model C.51 has the looks of a de-luxe cooker yet sells at a price that suits the mass market. With its large oven and hotcupboard, useful storage drawer, and interchangeable 2-plate and 3-plate hobs, the C.51 appeals both to the housewife and the housing authority.

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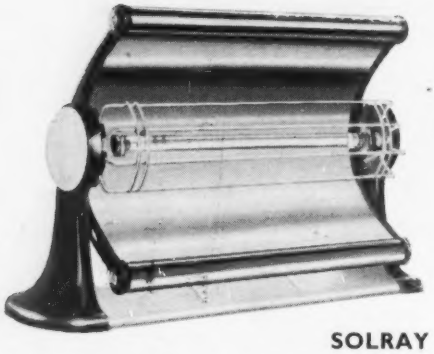

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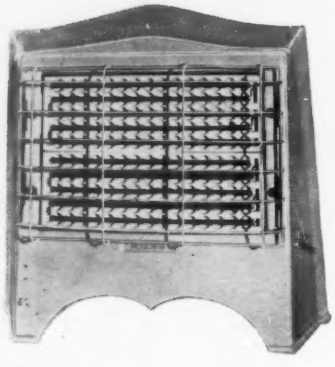

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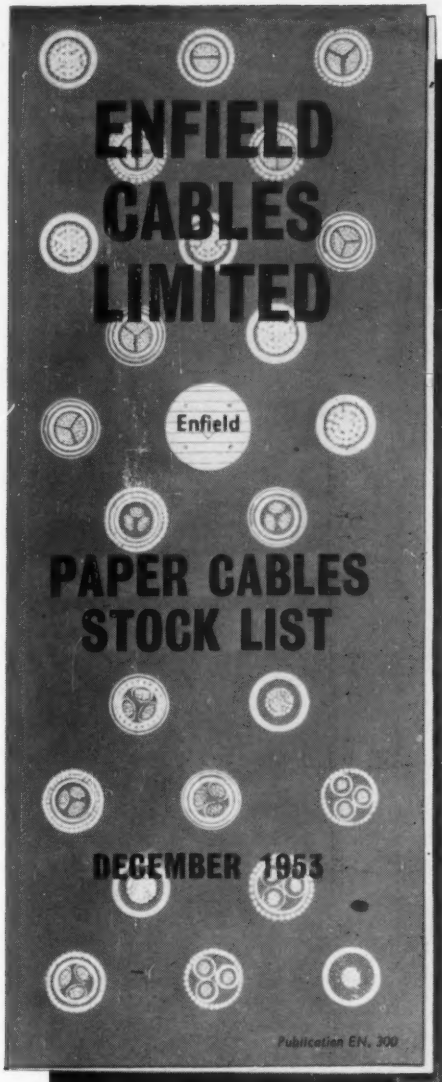

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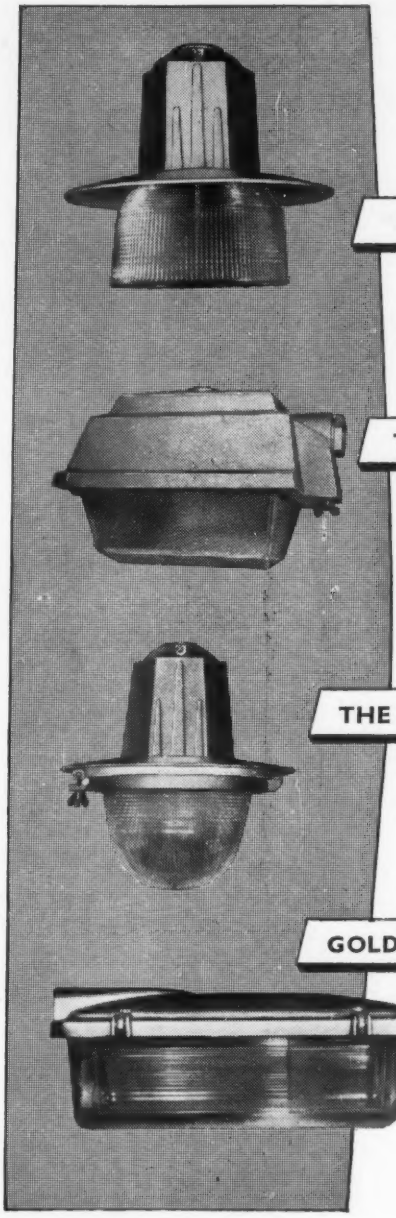

These four fittings from the ELECO range of street lighting lanterns embody all the latest improvements as recommended in B.S. Specification 1788 for lantern construction.

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THE LANCASTER lantern is a controlled cut-off fitting which reduces glare to a minimum. The distribution from the horizontal Mercury discharge lamp in the upper half of the fitting is reflected by means of specially designed reflectors through the scientifically designed refractor bowl giving high and even illumination on the road surface.

THE LETCHWORTH lantern incorporates a 12″ diameter reflector and two pairs of focal positioning stops. The bowl type refractor is designed for use with gas-filled lamps from 100W to 200W and combines maximum light control, with the highest possible efficiency. The joint between the refractor, refractor ring and body casting is rendered dust-proof by the use of thick white felt gaskets.

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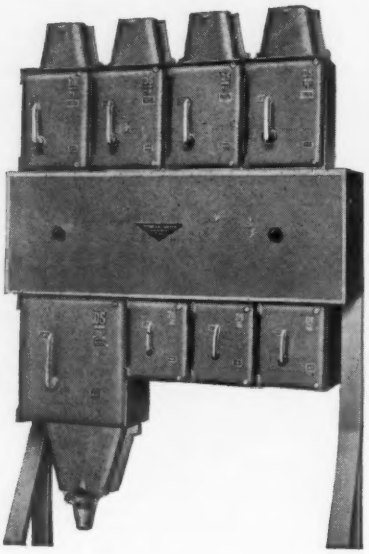

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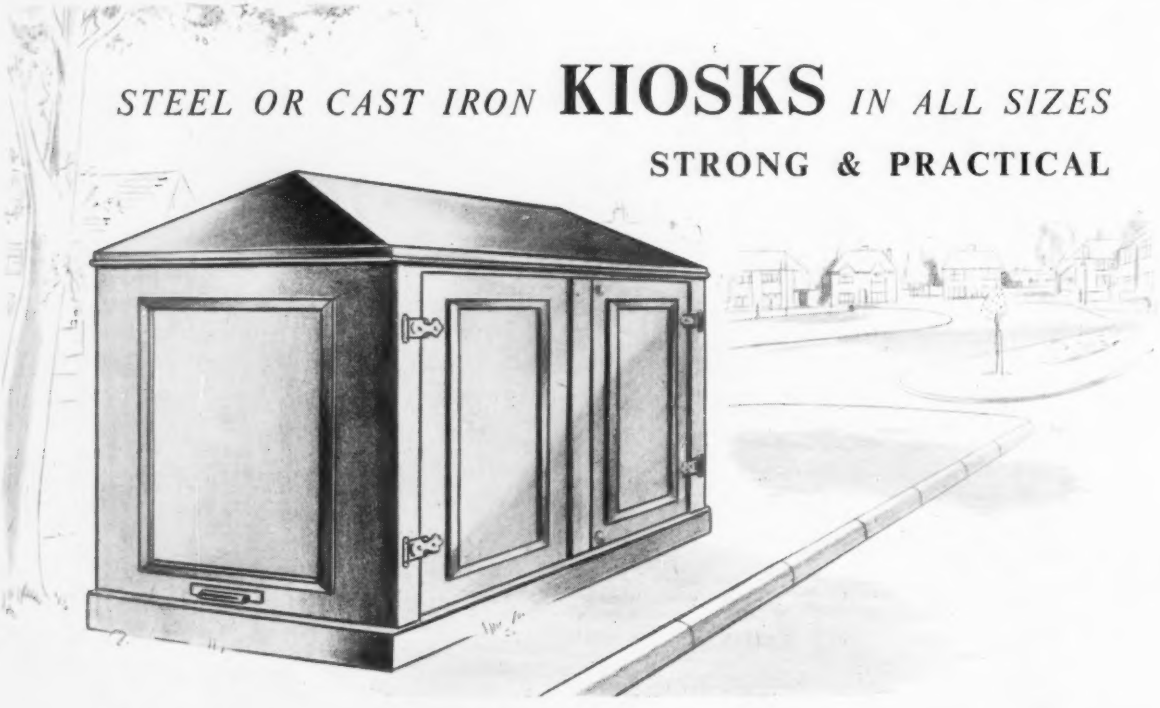

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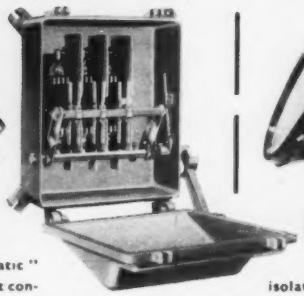
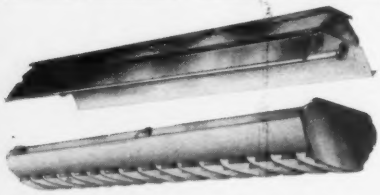
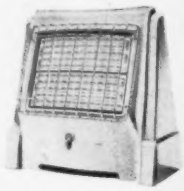


Typical of the range of Revo floodlights for tungsten, mercury or sodium lamps

A heavy-duty isolating switch for industrial installations

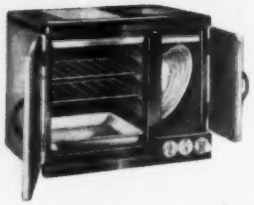


An industrial trough type reflector fitting, together with a decorative model, both using 4 ft or 5 ft. tubular fluorescent lamps



The Revo "Dolphin" electric fire in vitreous enamel with B.S.S. guard

The range of Revo electric fans includes models for desk, wall and ceiling mounting.



(*left*) The Revo "Peerless" cooker, designed for table use or with special stand, incorporates a roomy oven, plate warming compartment, grill-boiler and 8 boiling plate.

(*right*) This "Festival" fluorescent lantern and cast iron column is representative of the wide range of Revo street lighting equipment

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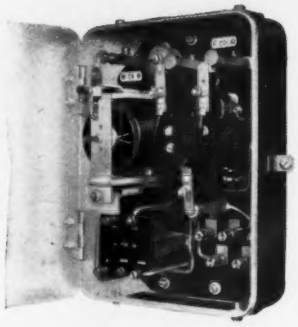

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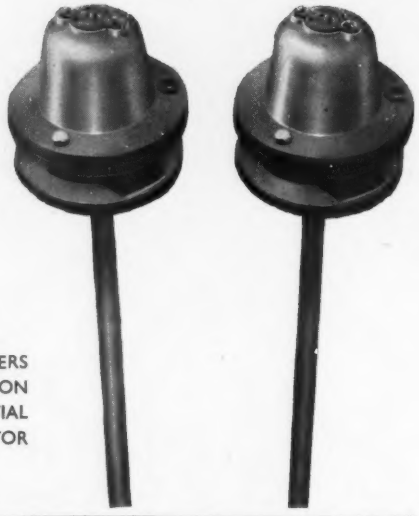

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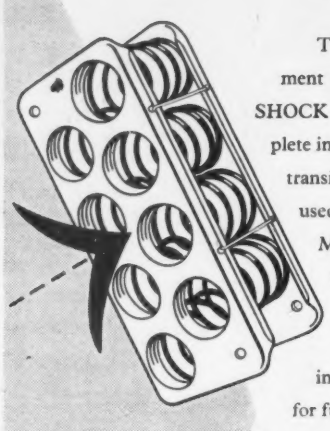

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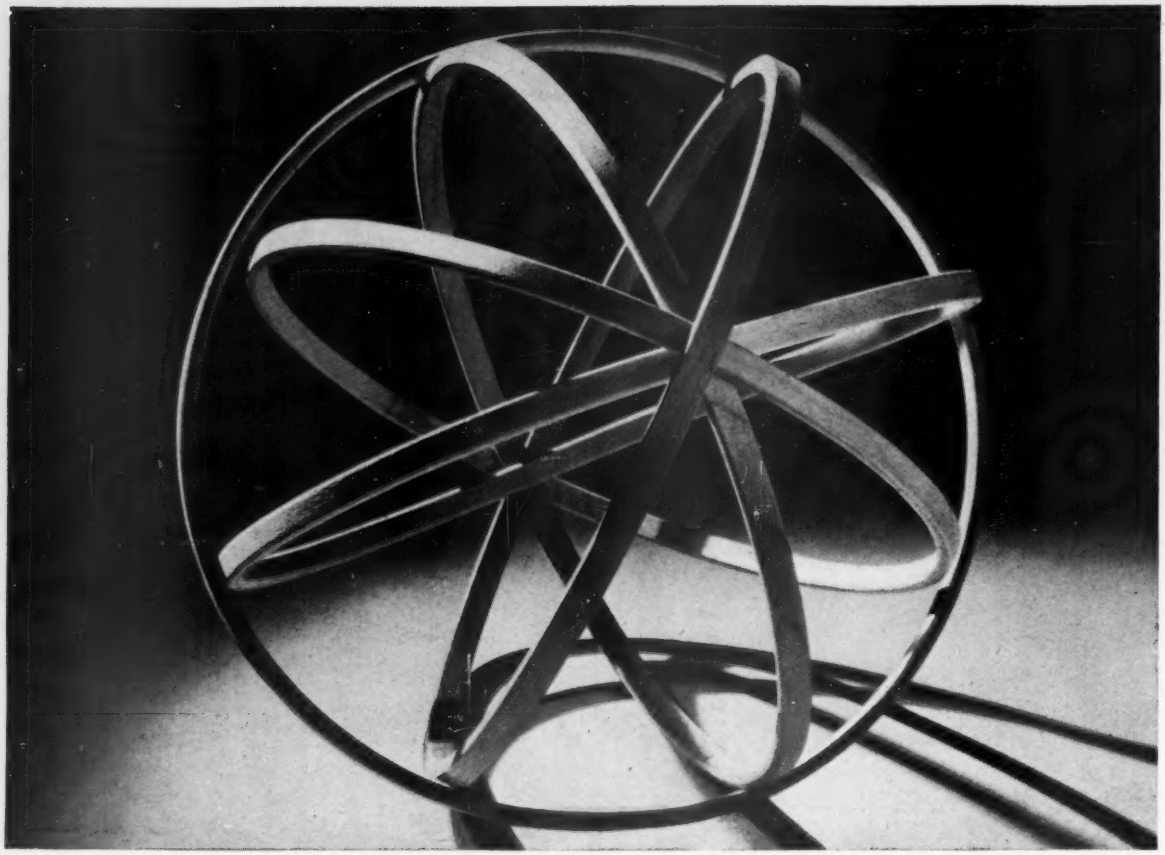

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** The word armillary has nothing to do with either armadillos or armament. It comes from the Latin* armilla, *meaning bracelet. An armillary sphere was a model made by the Greeks, 2,000 years ago, to depict the great circles of the heavens. But that was a little before our time.*

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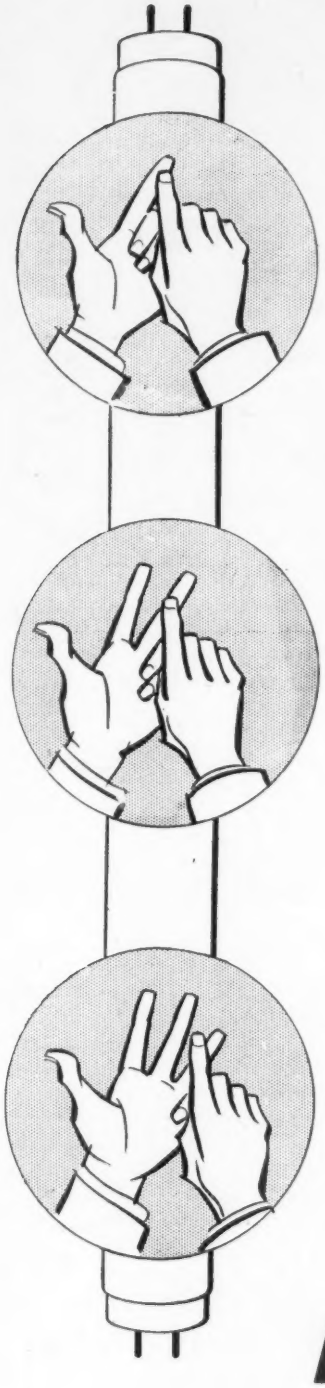

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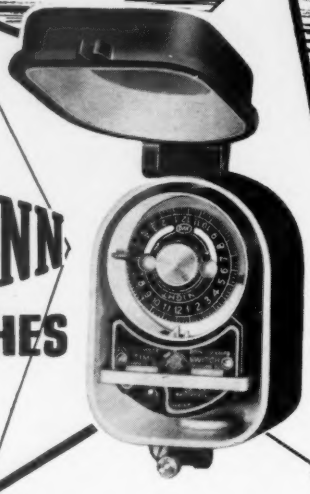

Type "V"

The comprehensive range covers hand wound models (15, 21 & 40 day run), electrically wound models and synchronous models with or without spring reserve, as required. Models are available for public lighting, off peak tariff and shop window lighting control, etc., etc.

Many years of experience in the design and manufacture of automatic lighting appliances ensures that HORSTMANN TIME SWITCHES meet the exacting demands of modern lighting control.

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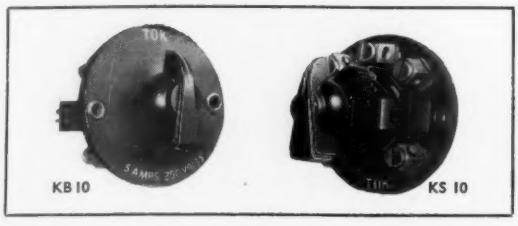

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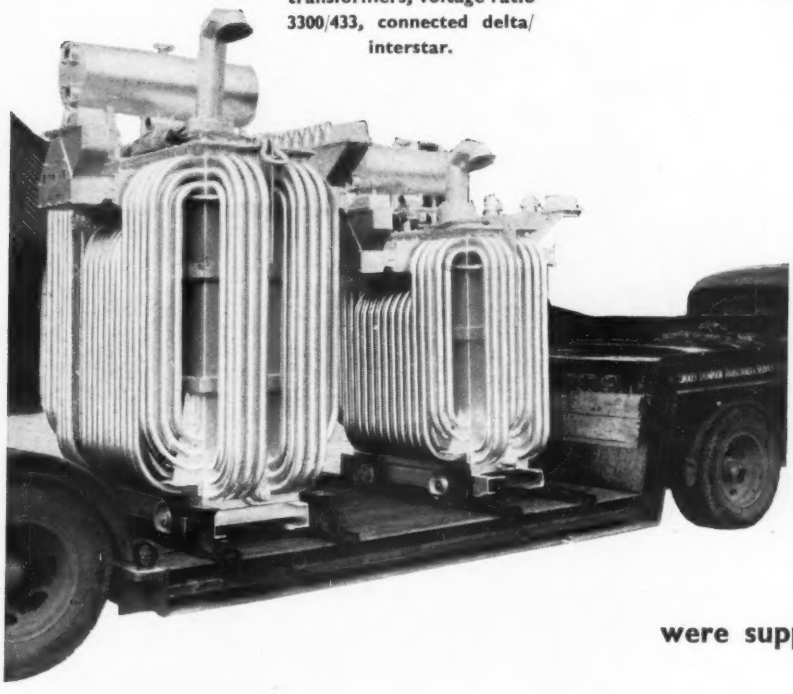

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The Philips " Alfriston " fitting, with louvre, illustrated, is a lightweight twin lamp. Industrial Channel Fitting for ceiling mounting in ivory stove enamel. An alternative one-lamp fitting is the " Ayr ", without louvre.

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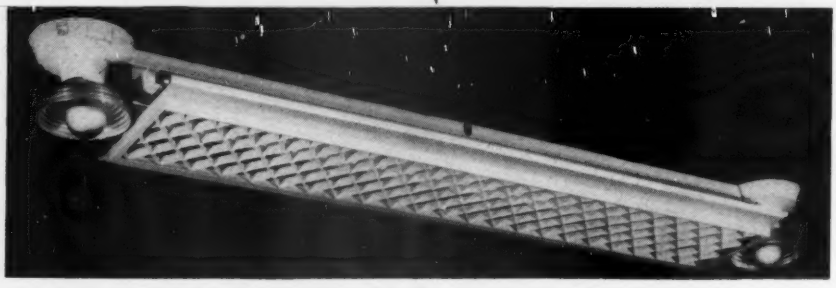

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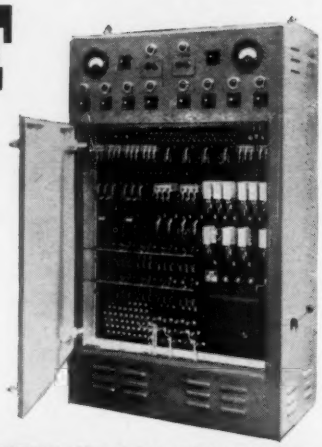

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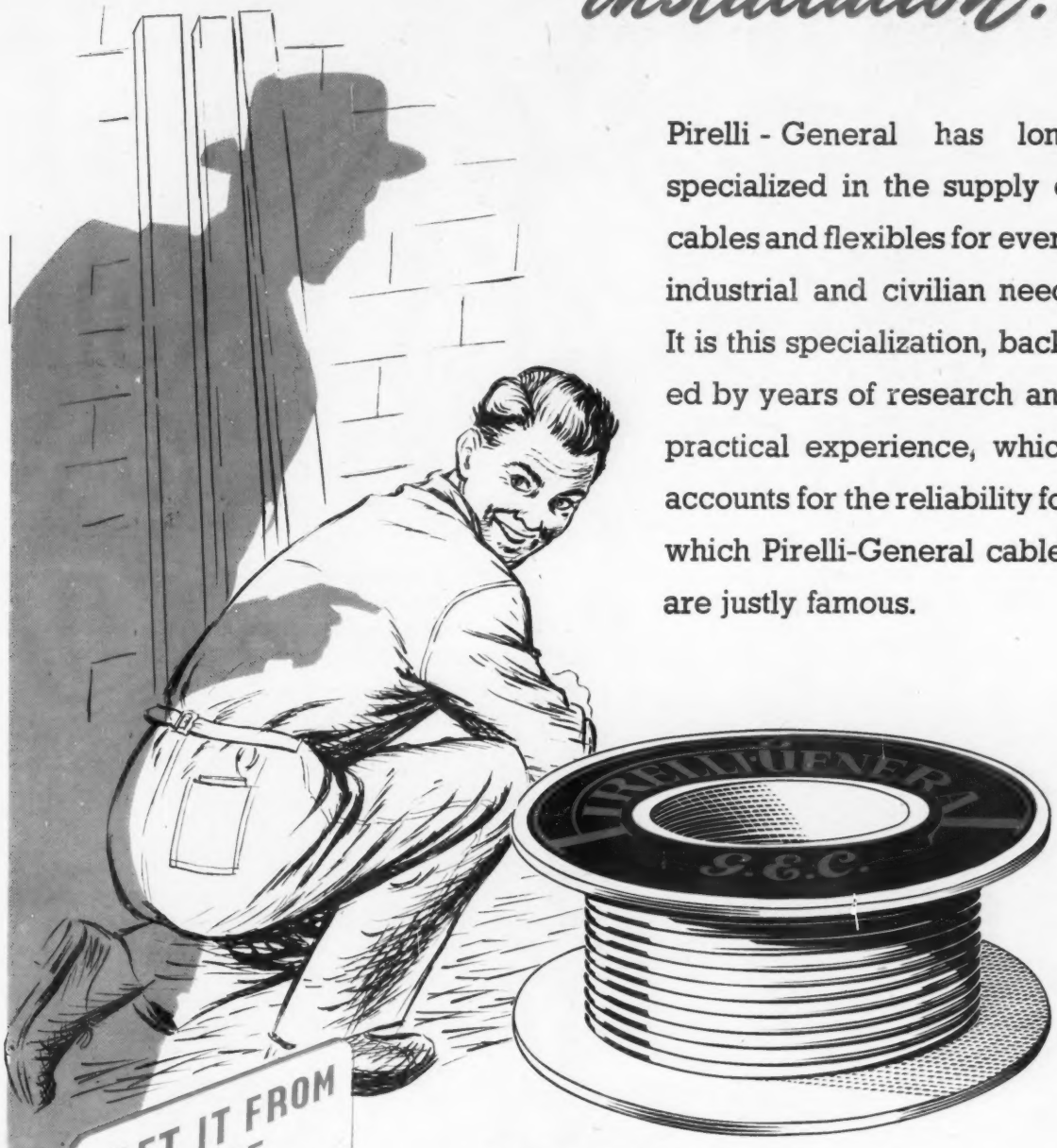

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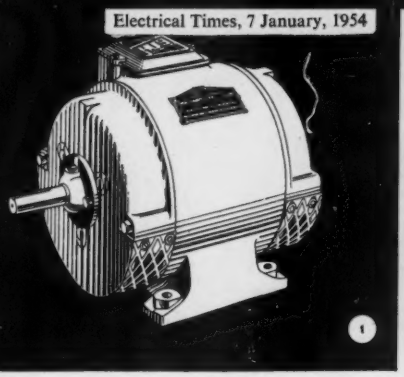

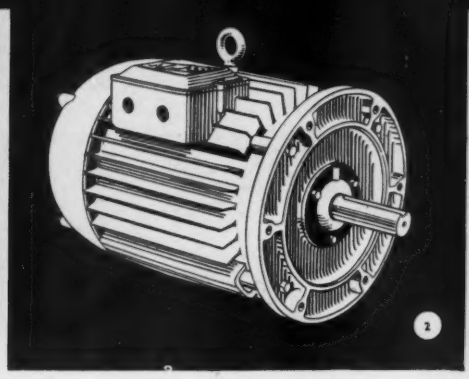

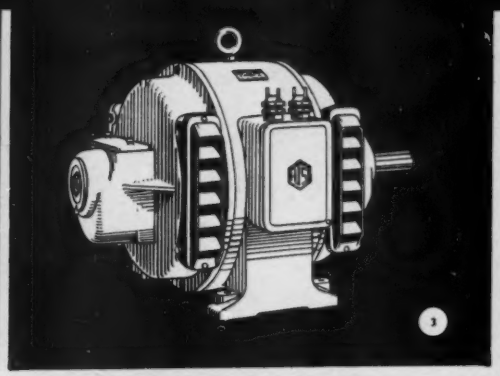

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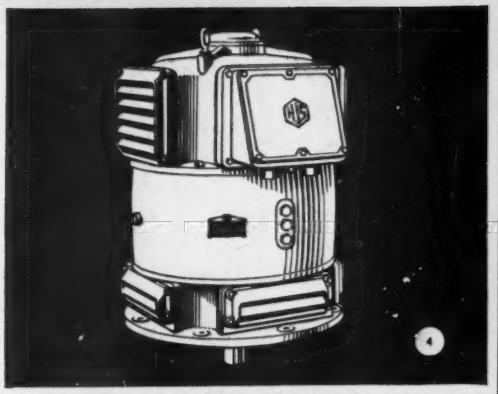

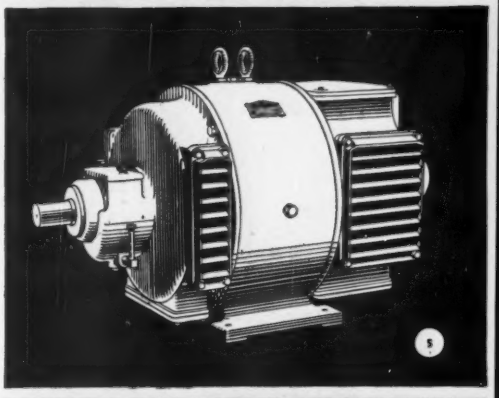

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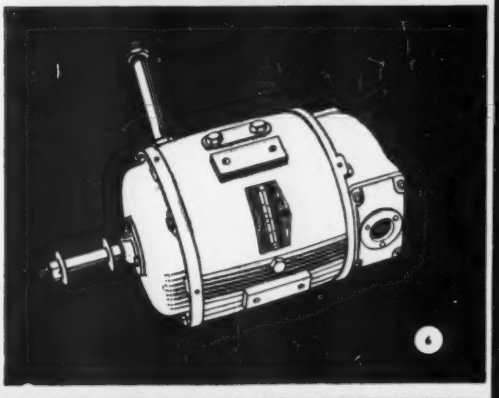

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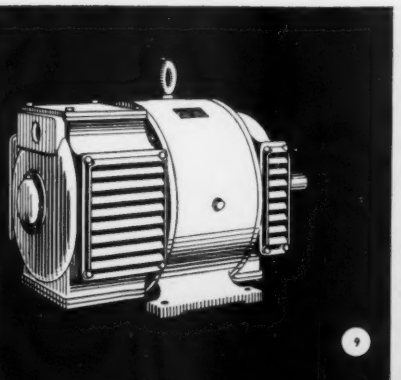

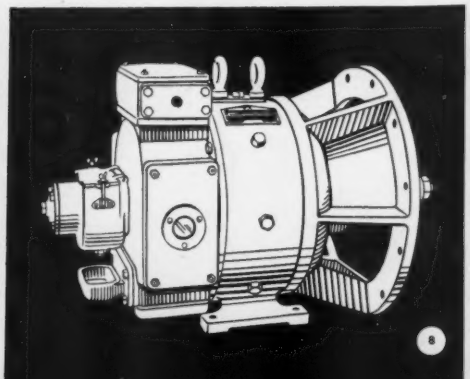

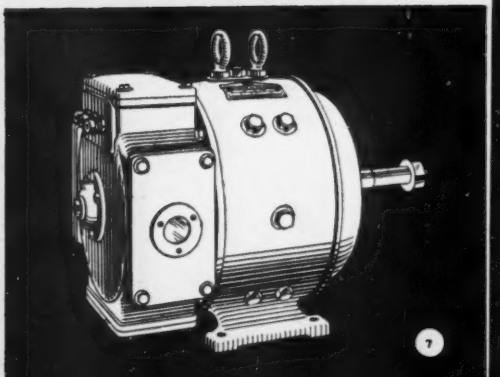

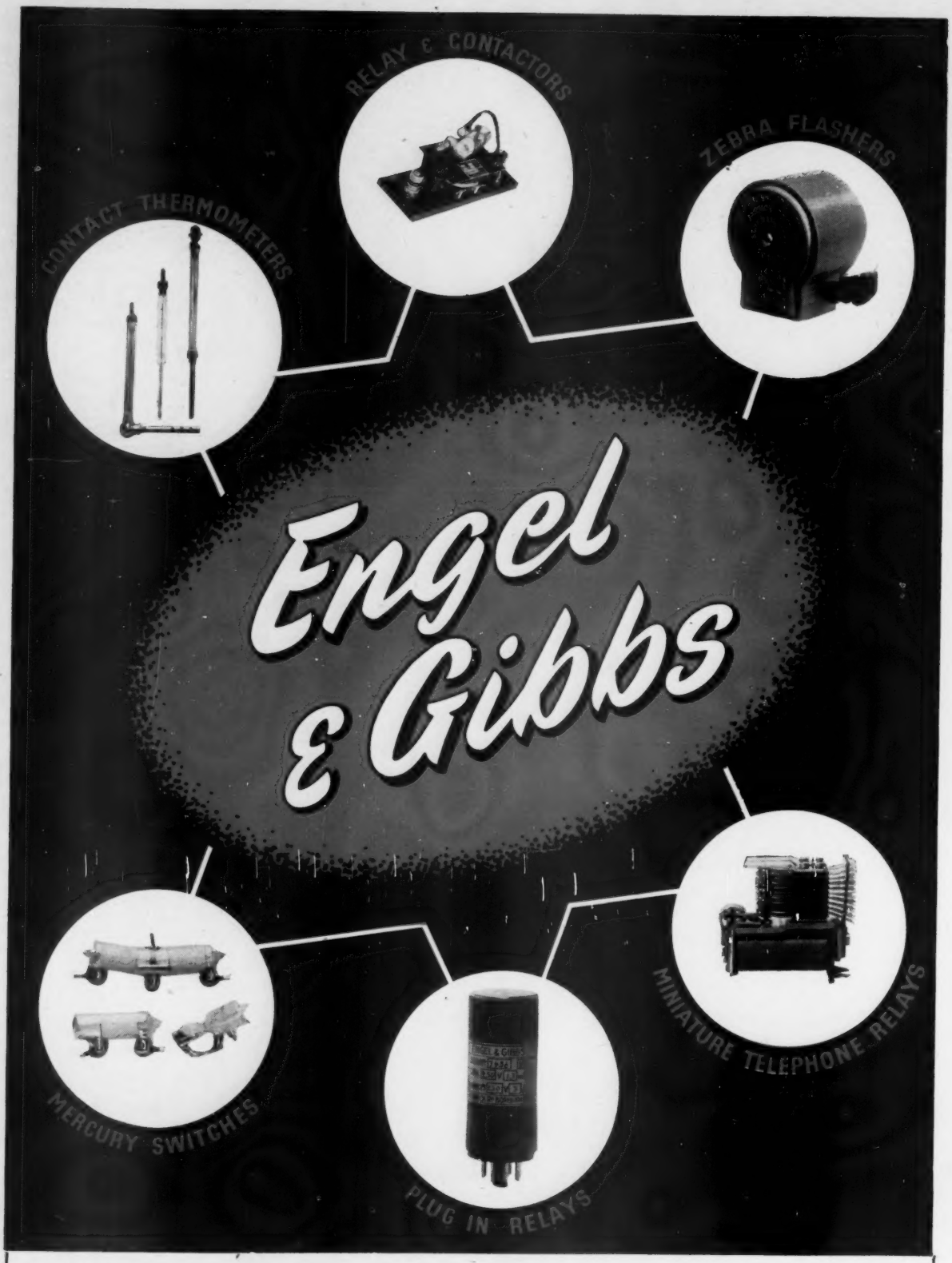

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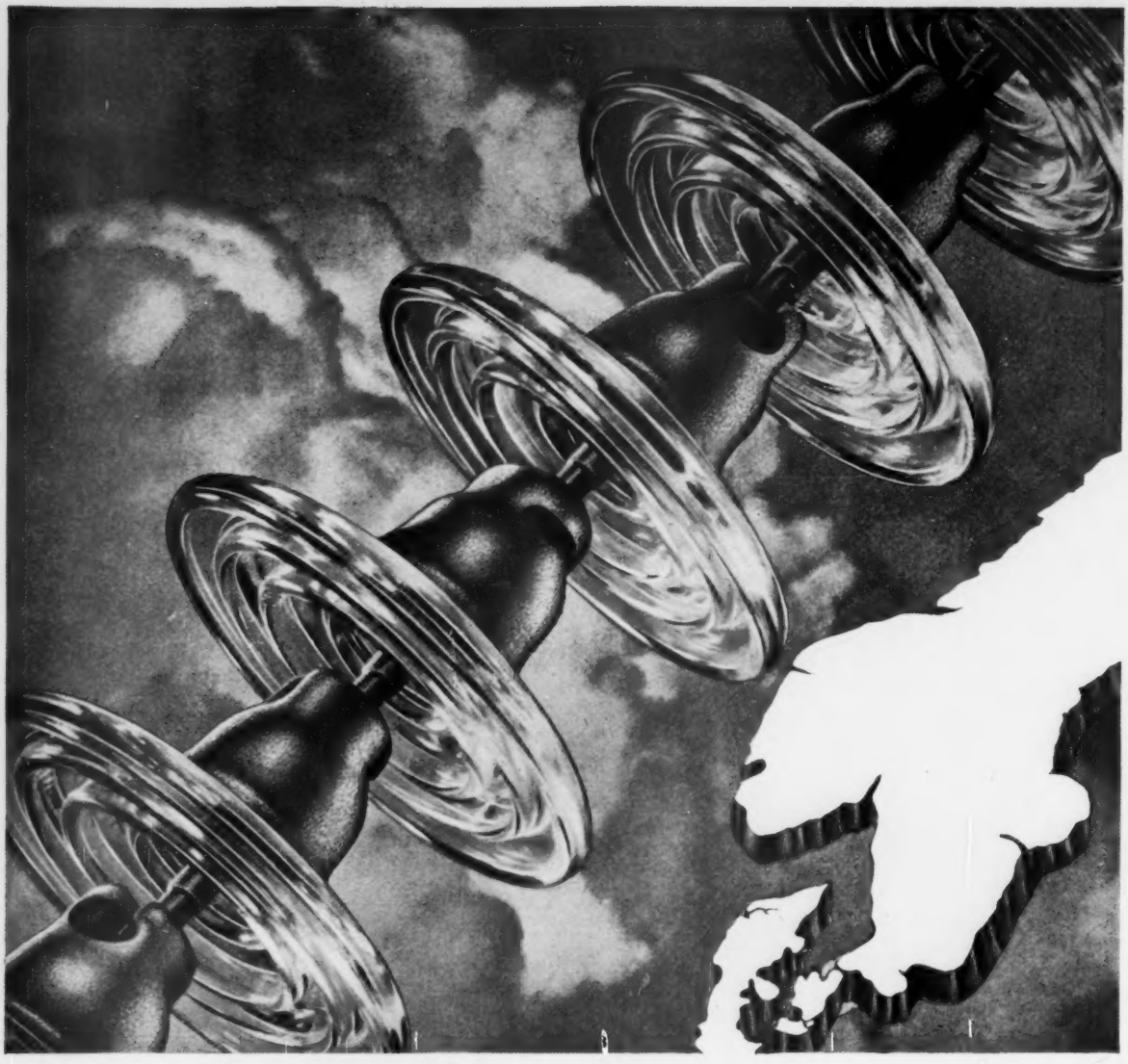

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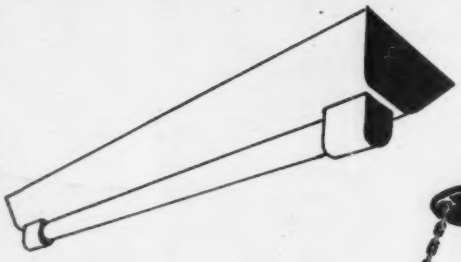

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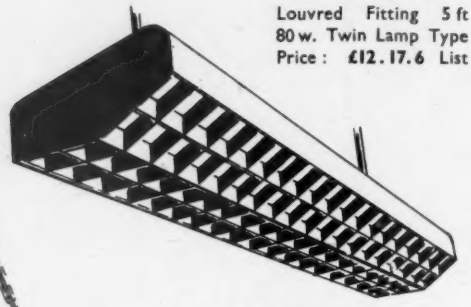

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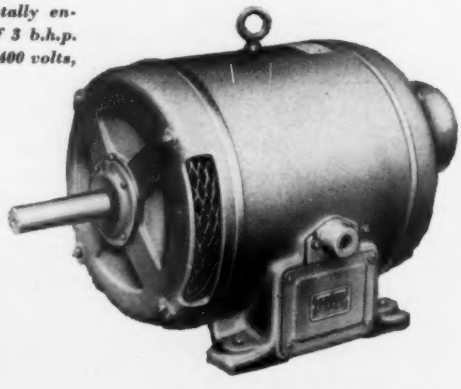

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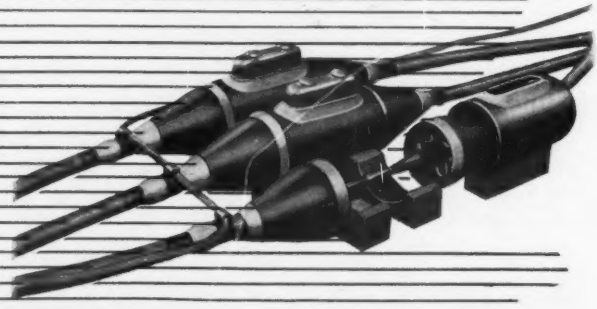

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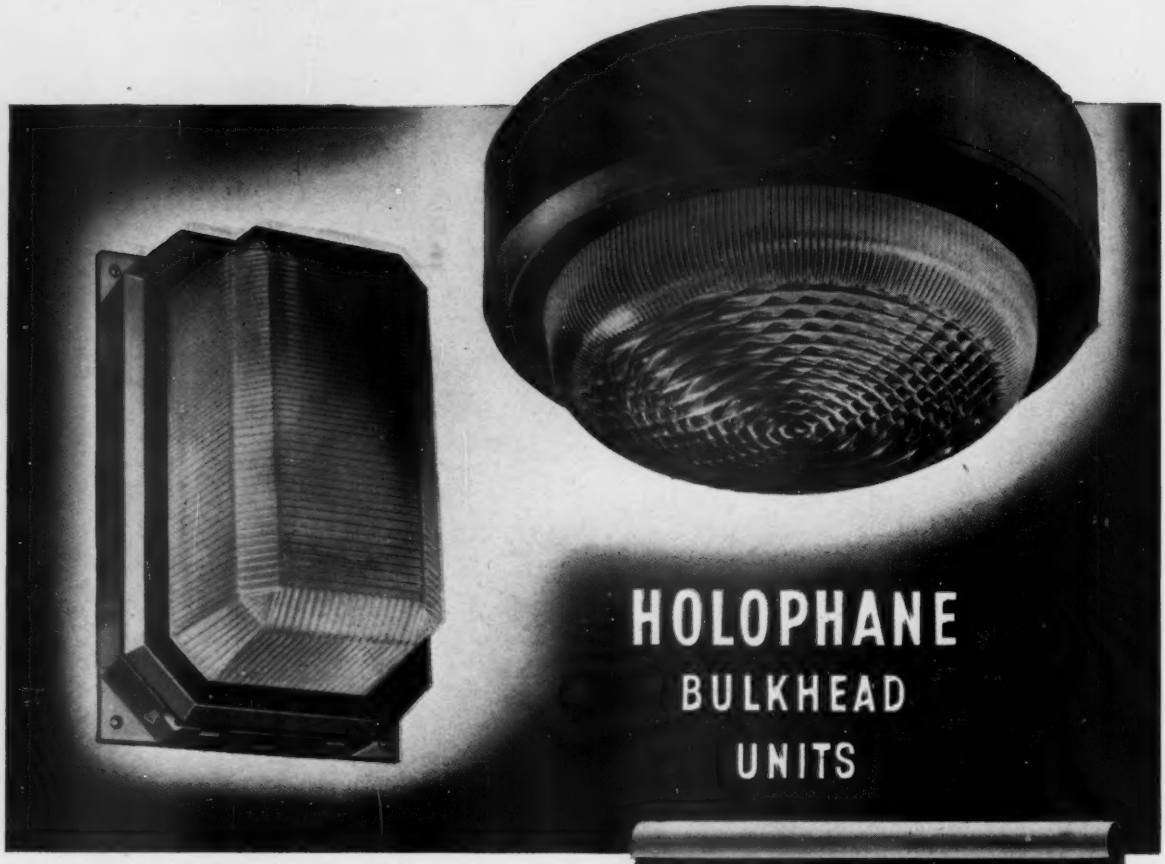

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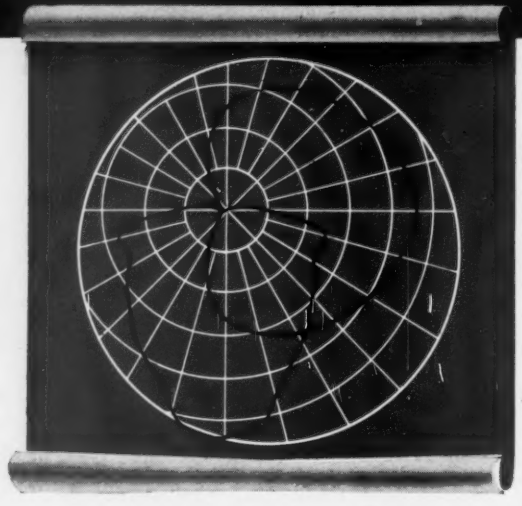

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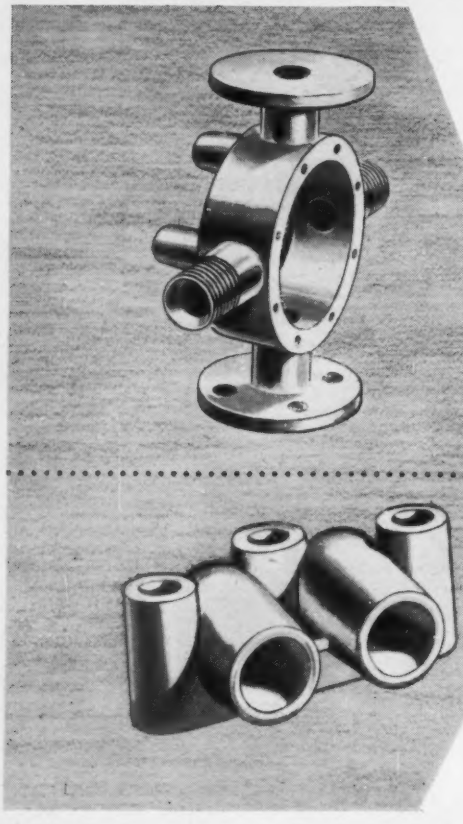

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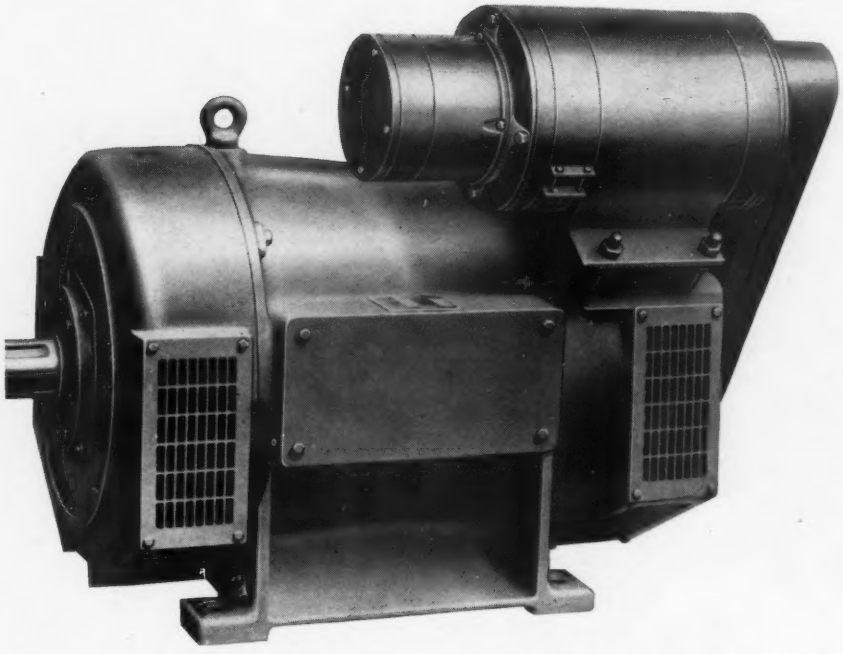

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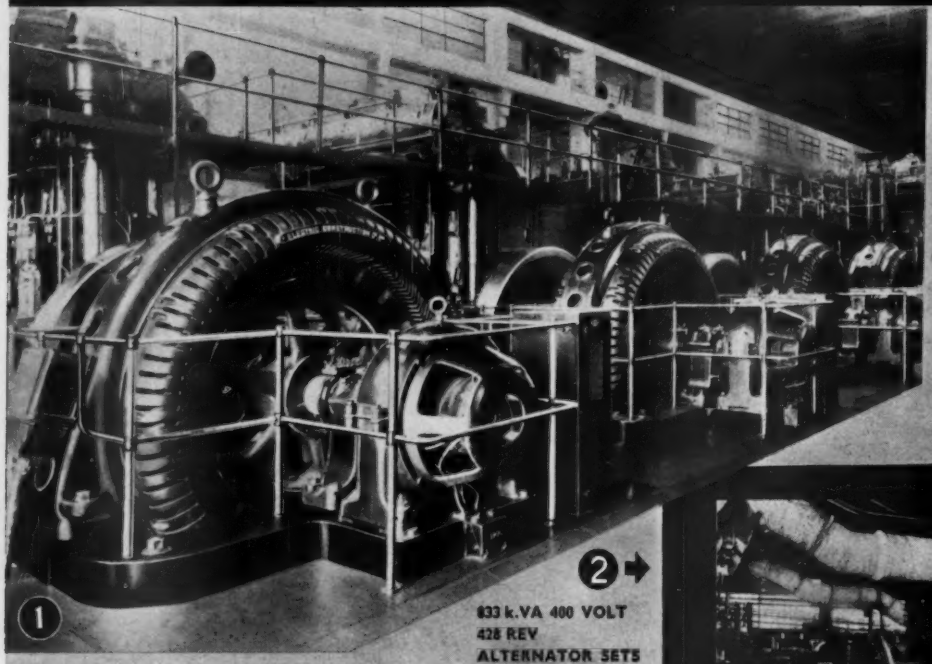

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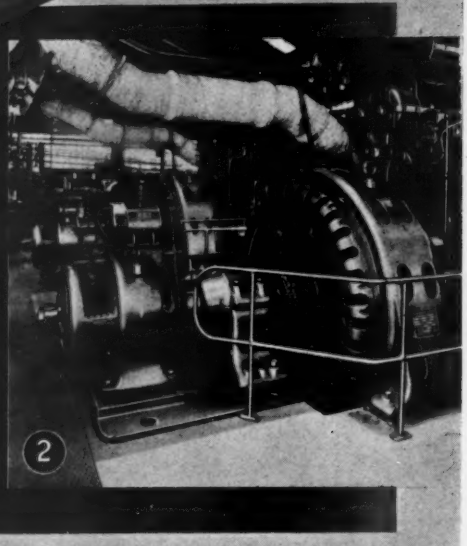

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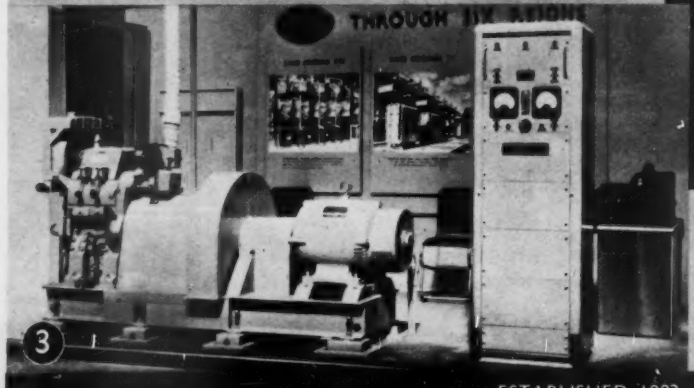

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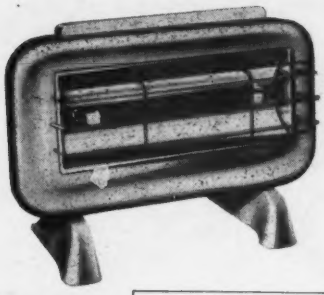

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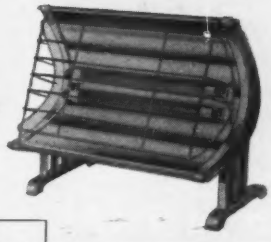

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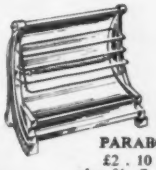

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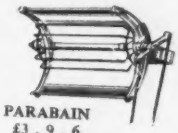

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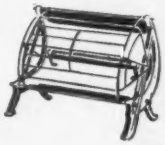

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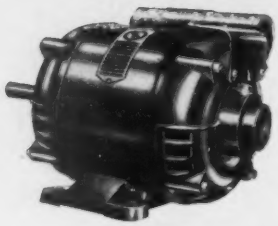

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BRITISH ELECTRICITY AUTHORITY

Pursuant to the provisions of Section 37(1) of the Electricity Act, 1947, the following tariff for the supply of electricity by the Central Authority to the Area Boards has been fixed and will come into operation on the 1st April, 1954.

TARIFF

Electricity will be supplied at this Tariff during each year of account to the Area Board at the points of supply at which electricity was being supplied to the Board by the Central Authority at the commencement of the year of account or at such points as may be agreed between the Central Authority and the Area Board.

The price to be paid for electricity so supplied in each year of account shall be the sum of the charges set out in paragraphs (A) and (B) hereunder:

(A) Fixed Kilowatt Charge

For each kilowatt of simultaneous maximum demand on the Central Authority the sum of £4 15s. (four pounds fifteen shillings).

For the purpose of ascertaining the amount of the fixed kilowatt charge "simultaneous maximum demand on the Central Authority" means in respect of each year of account twice the largest number of kilowatt-hours supplied by the Central Authority to the Area Board during any half-hour between 7 a.m. and 7 p.m. on any Monday, Tuesday, Wednesday, Thursday or Friday or between 7 a.m. and 12 noon on any Saturday in the year of account.

(B) Running Charge

For each kilowatt-hour supplied by the Central Authority to the Area Board during the year of account the sum of 0·5d. (decimal five of a penny).

Variation of the Running Charge

The running charge shall be increased or reduced by 0·00065d. (decimal nought nought nought six five of a penny) for each penny (a halfpenny or any greater part of a penny being treated as a penny) by which the fuel cost per ton in the year of account shall be above or below 60s. (sixty shillings).

For the purpose of this variation:

(a) *Fuel cost per ton* in any period shall be determined as follows:

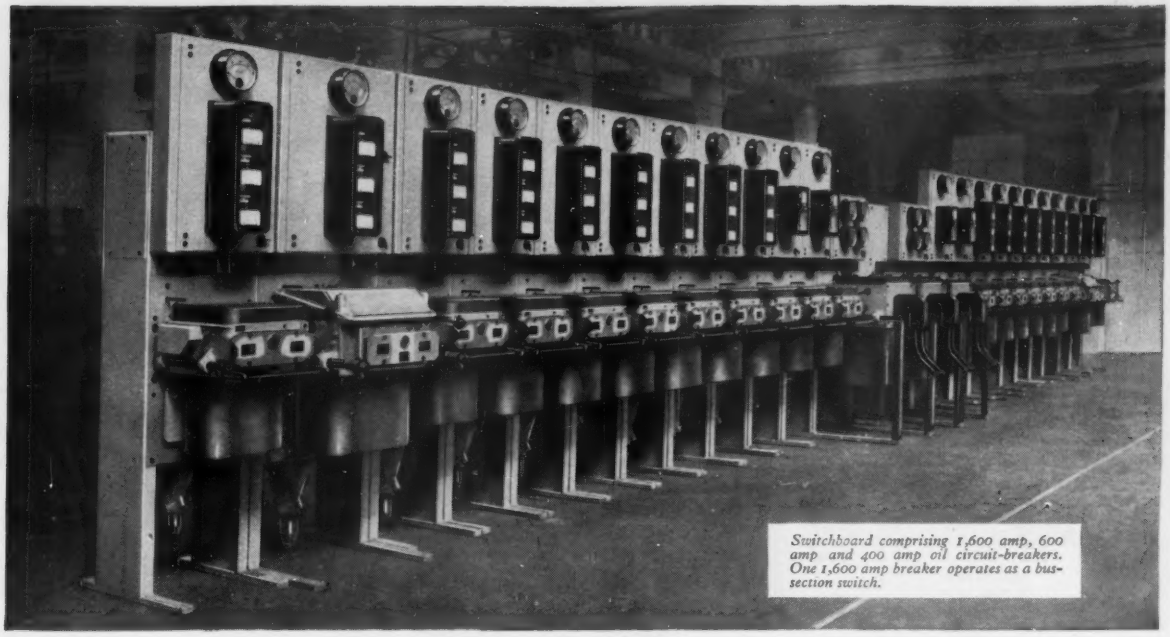
The total cost of fuel consumed in the period at all the Central Authority's stations in the Area of the Area Board taking the supply shall be divided by the total number of tons of fuel so consumed and the cost per ton so obtained shall be multiplied by 11,000 and divided by the average gross thermal value of the fuel so consumed expressed in British Thermal Units per lb.

(b) *"Cost of Fuel consumed"* shall mean the sums expended for fuel consumed plus the cost of any transport, handling, preparation or treatment incurred in connection with the delivery of the fuel to boiler hoppers or furnaces and in connection with the disposal of the products or residues of combustion, together with the proper proportion of salaries and wages, and any contributions for pensions, superannuation and insurance of officers and servants attributable thereto, less any sums received from the sale of any products or residues of combustion.

ERNEST LONG,
Secretary.

December, 1953.

British Electricity Authority,
British Electricity House,
Trafalgar Buildings,
1, Charing Cross, S.W.1.



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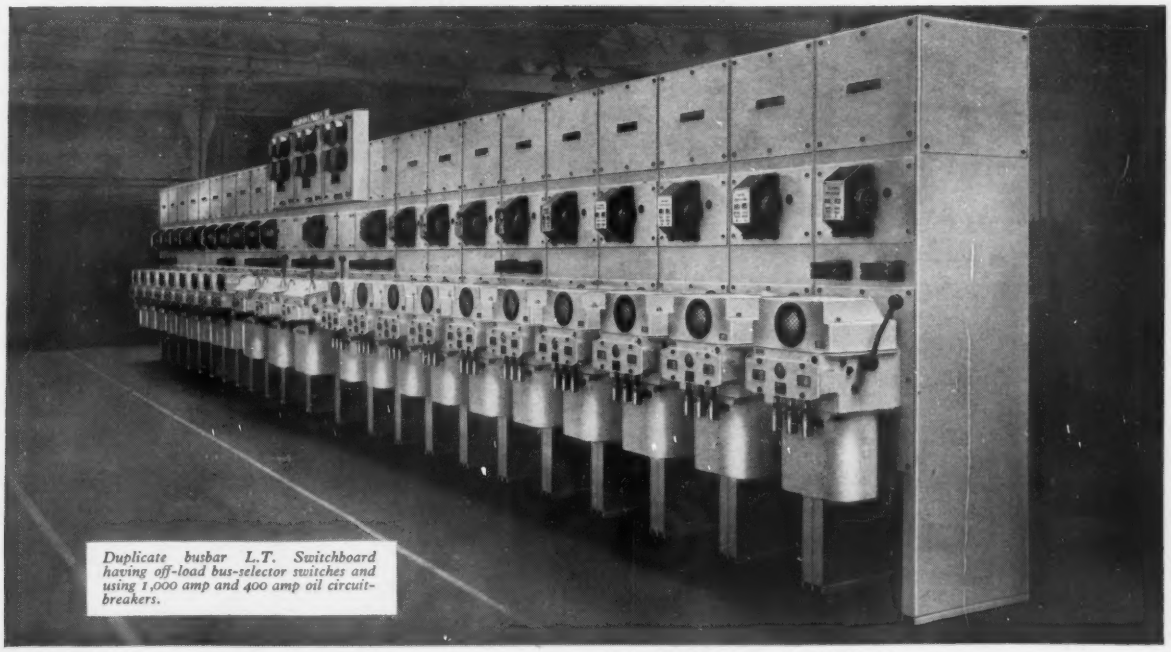

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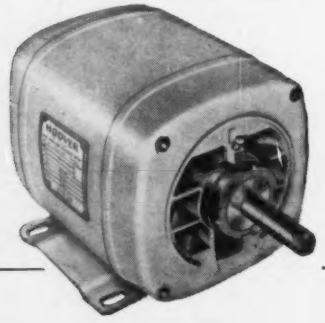

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 7 JANUARY, 1954
Volume No. 125 Number 3244

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BOOST FOR ELECTRIC HEATING

The changes in purchase tax announced on Monday are welcome; let there be no doubt of that. For the first time since 1948 the rate of tax applicable to electric space and water heaters is brought down to that for gas appliances; the use of the fiscal weapon of purchase tax as an instrument of a misguided national fuel policy is most properly, if tardily, interred. At last electrical heating is free to compete confidently with gas on a basis of convenience and running cost, without the special burden of a penal rate of taxation. All sections of the electrical industry may expect to benefit from these changes, but this said, a complaint remains. Such is the nature of purchase tax that every year someone must suffer. This year it is the retailers, and for the second time in a fiscal twelvemonth. Tax has been paid on the stock they hold, and that proportion of it represented by the present reductions will be irretrievably lost. The unexpected timing of the change in rates has prevented retailers exercising such precautionary tactics as are open to them. The Christmas buying season can have had but little effect in reducing stocks of water heaters or, in a mild year, of fires. It is worth recalling in this context the recommendations of the Hutton Committee; which the Government accepted with almost unseemly haste last May. It was concluded by this Committee that compensation should not be paid to traders holding tax-paid stocks when rates of purchase tax were reduced. Just as firmly, however, it recommended that changes in purchase tax at any one time should be moderate, and that they should be made only at the time of the budget. With the disregard of the qualifying suggestions the argument for "no compensation" loses much of its force, and a practicable scheme for offsetting losses should be worked out forthwith.

RE-ANGLED BULK TARIFF

The new bulk supply tariff that the B.E.A. has announced this week has been widely heralded both in statements by the Authority and in anticipatory tariffs published by various area boards. The reason lies with the change it makes from the long-used fuel cost basis of 38s./ton to a more realistic level of 60s./ton, which is not greatly below the figure likely to be applicable in the cheap-coal generating divisions this year. Yet although this alteration is the eye catching feature of the new tariff, there are other changes of more significant importance. Fixing the basic running charge at a halfpenny

a unit under the new tariff introduces effectively a small reduction in price as compared with what was being paid under the old tariff, and the reduction in the coal cost adjustment figure accentuates this effect. The change is made possible, of course, by improved efficiency of generation, but the mounting capital cost of such efficiency is unpleasantly emphasised in the sharp rise in the kW charge. Increasing by 9s. 6d., the sharpest step yet, to £4. 15s., this component takes on additional importance, giving renewed emphasis to the economic advantages of a high load factor. But it is perhaps the interaction of the changes in unit prices and fixed charges that provides the most interesting aspect of the new tariff. At 50% load factor, a board charged for coal at 60s./ton will pay the not inconsiderable amount of 0·01 pence per unit more under the new tariff: whereas the board whose running charges are based on 80s./ton will actually secure a slight reduction. The meaning here is clear: the revised tariff is a small but appreciable step towards a universal unit rate.

CLOUD OVER CONTRACTING

As we go to press, the whole great business of electrical contracting is again under the shadow of strike action. In spite of the efforts of the Court of Inquiry which investigated the dispute last October, the National Federated Electrical Association and the Electrical Trades Union have again reached deadlock on the question of a wage increase, and recourse to the crudities of the strike and the lockout seems imminent. In these circumstances it is well to examine again what the Court of Inquiry had to say about the dispute apart from its general condemnation of both sides for the way they handled it in the early stages. The Court found that the hub of the disagreement was the choice of a base date for cost of living calculations. On the one hand, the union produced figures showing a stiff rise; on the other, the employers equally convincingly demonstrated comparative stability. Here, said the Court, is a question of fact essentially suitable for arbitration even if the whole question of a wage increase cannot, for some reason, be settled in this manner. What has happened to this eminently practical suggestion? We are told that the employers have refused a rise; that the employees have rejected the suggestion that they should go to arbitration. If the complex machinery of joint negotiation can indeed produce no more satisfying result than "failure to agree", surely it is worth while taking an independent opinion on the essential factual question.

STANDARD VOLTS AT SCHOOL

In recent years there has been a marked increase in the use of voltages below the standard 240. In factories and on building sites, the 110 V centre-tap earthed transformer is being used to give supplies to portable tools, auxiliary lighting fittings and the like, where there is an increased risk that insulation may fail and protective earth continuity be lost. As yet, however, this practice has not extended to the non-industrial field, except in a few medical applications. Thus the reported decision of the Chester Education Committee to change to 110 V supply for a school largely breaks new ground. At first sight, the idea may seem attractive, for it reduces the shock risk where the prying fingers of children are concerned; but there are less expensive ways of doing this, and it is difficult to recall a case where a fatality has resulted from such an accident at school. Most classrooms of most schools provide a good insulation from earth so that, as in the home, 240 V loses much of its danger. In the face of this consideration, the inevitable extra cost of the 110 V supply is difficult to justify, though there may possibly be a marginal case for it in laboratories.

EARTHING UNCERTAINTIES

Few techniques are more common in the practice of electrical engineering than earthing. Yet time and again, there is evidence in reports and in installations that many engineers fail to appreciate how complex are the fundamental ideas which apply. The difficulty arises initially from the dual use most of us make of the term "earthing." On the one hand, there is the prevention of excessive rise in voltage by utilising the electrostatic capacity of the earth; on the other, the use of the relatively low resistance earth continuity circuit, and sometimes of the earth itself, to ensure the operation of switch or fuse gear if insulation fails. The first function remains truly earthing in all circumstances; the second is often performed by what we all call "the earth circuit" without the general mass of earth being in fact involved. Unfortunately, these twin meanings are seldom clearly distinguished in elementary textbooks, or indeed, by lecturers, perhaps because no technically complicated apparatus is involved in the majority of earthing installations. In effect, the student is simply assumed to know what earthing means. For all its apparent simplicity, earthing is a subject which deserves close and careful attention in the theoretical training of engineers.

TEXTBOOK DECLINE

Reading the prefaces to their textbooks is not a practice that many engineers indulge in, so they are likely to be less familiar than reviewers with the author's standard apology for "presenting yet another volume on this subject." The apology, to be sure, is always followed by a justification of that very act, and it must be admitted that in most cases the reasons presented are convincing, mainly because quality in a text book depends very much on what a particular reader wants. It follows that the more textbooks there are to choose from, the better for the average student, though the publisher may have a different feeling about the matter. From this aspect, the news that there were fewer new engineering textbooks published in 1953 than in 1952 makes unwelcome reading. According to the analysis published in the *Bookseller* last week, the drop was relatively small, only about 10% on an annual total of more than 300 volumes, and it followed the pattern that was apparent throughout the whole range of publishing, from "religion and theology" to "fiction"; but nevertheless, this reduction was the first since the war. There is some consolation, however, in that the classification "technical handbooks" shows an increase that brings it into one of the top five places on the booksellers' table.

Meteor

The attractive second floor fashion department at the Liverpool Store of Lewis's Ltd. Designed by Bronik Katz, the department makes use of two false ceilings. Above the lower is three colour neon lighting. On each side of the central ceiling can be seen bays in the upper false ceiling, in which is installed further Neon lighting

Supplies for a Rebuilt Store

PRESENT-DAY design in architecture, decoration and display, when applied to a modern department store, make demands on the resourcefulness and ingenuity of the electrical engineer if the installation is to make its contribution without detracting from the final appearance. What this can mean in practice is to be seen in a recently completed installation at the Liverpool store of Lewis's Ltd., where extensive war damage necessitated the equipping of the entire building. The first stage of the work has now been completed, and its description affords a useful indication of requirements likely to be met in general.

In its general layout, the store has an L shape, the main frontage being in Ranelagh Street. It is this part of the building which, so far, has been re-equipped and modernised and hence the description which follows applies only to this wing. The corner section of the building, completely destroyed by bombing, is now being rebuilt, whilst the wing facing Renshaw Street was damaged by fire. Although in use, for both store departments and offices, this wing awaits completion of the corner section, when it also will be completely re-wired and redecorated.

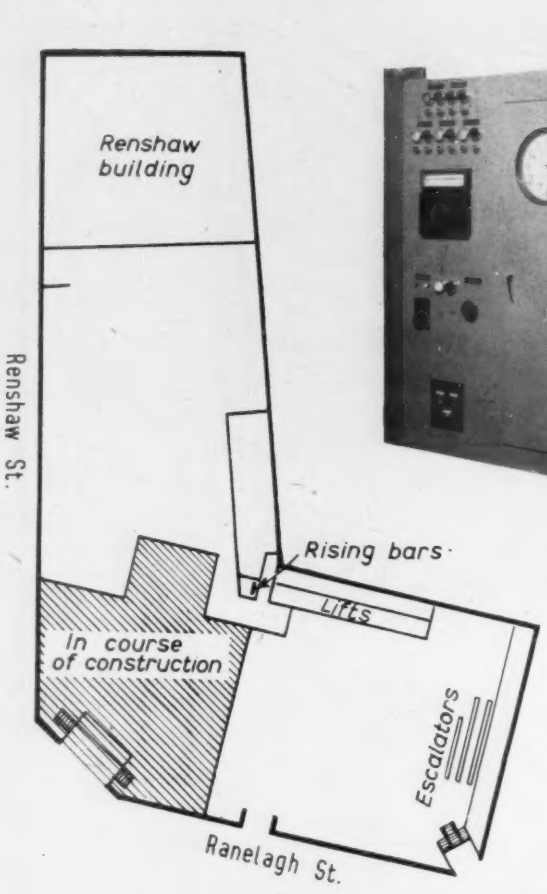
There are eight storeys to the modern wing, two underground. From the basement to the fifth floor, which are used as store departments, access to each floor is by way of lifts or the main stairway, whilst escalators provide additional means between ground and fifth floors. The lifts also extend to the sixth floor but this floor is used only by Lewis's staff. Six lifts are in use at the moment, although a further two are being installed. Fig. 2 shows their location, at the far side of the building, and also indicates the approximate position of the escalators.

The main supply, at 6·6 kV, is taken from the Area Board's h.t. ring main, each leg of the main terminating at an o.c.b. with a bus-coupler between. Arranged at each end of the Board's switchgear are the two main o.c.b.s which feed to each end of a nine panel o.c.b. high tension switchboard controlling the radial feeders to each of the four transforming stations. Forming the centre panel of this board is a bus-coupler, which is Castell locked with the main isolators at each end to avoid alteration of the Area Board's ring main setting. Whilst the Board's switchgear is of Reyrolle manufacture, that of Lewis's Store is by English Electric, of 11 kV, 250 MVA capacity (Fig. 6). Protection to the installation is afforded by c.t. operated overcurrent and earth fault relays on each breaker. Busbar protection is also used, employing two Merz relays to discriminate between the two sections of the bars.

Main Distribution System

The spinal cord of the store's distribution system, by which supplies for each floor are taken, is fed direct from the main h.t. switchboard. Two three-core 19/·064 p.i.l.c.s.w.a., 11 kV cables each feed, from an o.c.b. on different bus sections of the board, a 600 kVA delta/star transformer located in the sub-basement of the "inside corner" of the "L". To the 440 V side of each is connected through a 1000 A, t.p.n. air-break isolator, a set of four rising bus-bars which ascend to the fifth floor. The star point of the secondary side is solidly earthed at a common earthing point for all transformers. To permit interconnection due to failure of the supply to one set, a 1000 A paralleling switch is fitted between the two supplies at the far side of each isolator.

Each bar, a copper tube some 2 in. in diameter rated at 1000 A, is supported off the wall on insulated clamps every 5 ft. It is made up of 10 ft lengths of tubing, each length being joined to its neighbour by bolted sleeves. At the lower end of each bar small holes are drilled to provide a current of air through the tubes. Supply to each isolator is taken in four 127/·103 v.r.i. cables from the transformer, each bar being connected by 3 in. by 3/8 in. hard drawn copper strip.



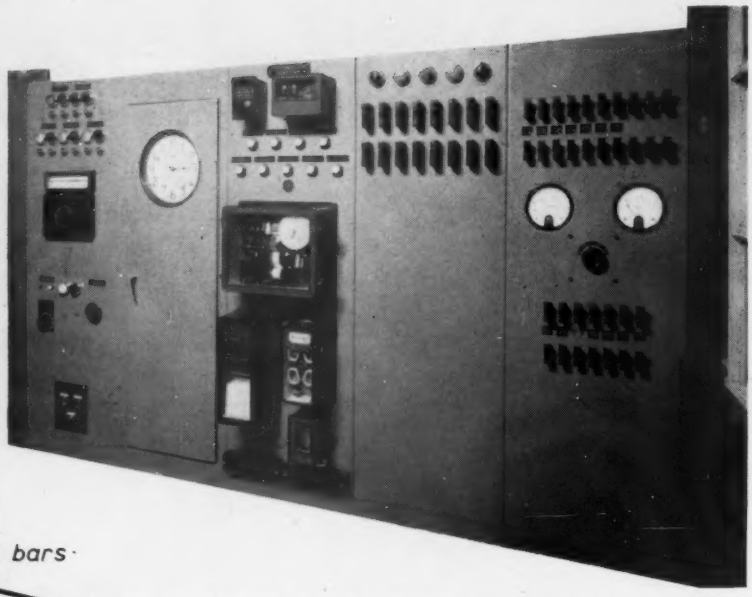


Fig. 2 (left), is a plan of the building showing layout. Fig. 3. From this board are controlled ventilation, heating, and clocks. The max. demand meter and recording ammeter are seen on the centre panel

Supply to each floor is teed-off using specially designed clamps to obviate drilling the bars. From phase to neutral bars, a pair of v.r.i. cables feed, through a d.p. isolator, a distribution fuse-board and switch panel (Fig. 14) which controls all lighting points on that floor. From the same phase on the other set of bars an identical arrangement feeds all socket-outlets on the floor. For lighting a 128 way switch panel is employed, each 5 A switch controlling one fitting, whilst the display outlets utilise a 96-way panel with 134 switches. Also on the same board is a 32 way switch panel controlling emergency lighting, the boards being made by the Power Centre Co. to Lewis's Engineering Department specifications.

From this board all wiring (usually in 3/·036 v.r.i. cable) is taken in a bank of 4 in. by 2 in. trunking to ceiling level. The bank is then run above the ceiling directly across the width of the floor, each individual trunking turning off at intervals to traverse the entire length of the department. Each run therefore lies between the ceiling and the floor above, adjacent to each longitudinal roof beam. At intervals, inspection and tee-off boxes, made specially by the trunking manufacturers, the Power Centre Co., are fitted, from which individual conduit runs are made to lighting fittings. These boxes, which permit side or base conduit entry, are accessible from the floor above, through square "manholes" cut in the parquet flooring.

Lighting fittings, mounted on alternate transverse beams, are supplied by cable run along the beams and dropping down to each unit. From one tee-off box two fittings are normally supplied, one on each side of the box. This does not, of course, apply at corners and sides of the building where the structure loses its regularity.

In general, fluorescent fittings, manufactured by Thorn Electrical Industries, are used on all but two of the departmental floors. Housing four 80 W fluorescent tubes, some 30 fittings are in use on each floor, giving an average illumination, at counter level, of 14 lumens /sq ft. Also supplied by a conduit system from the tee-off box are socket outlets fitted along beams and at the top and bottom of the supporting columns. An essential part of the installation, these outlets provide a supply for display cabinets, special features and auxiliary lighting which may be required almost anywhere at short notice. Manufactured by the Wandsworth Electrical Co., three or four outlets are usually connected on one spur. Four are provided at the base of each column, four at the top, together with additional outlets on both longitudinal and transverse beams.

Special Lighting Layouts

On two floors, however, the arrangements for lighting are completely different, being designed to suit the requirements of those two floors. One of these is the second floor, which is devoted to fashion displays and consequently is used from time to time for fashion parades. Designed as separate from the "standard" floor by Bronik Katz, extensive use is made of hanging ceilings and indirect lighting to create an effect appropriate to these purposes. As can be seen from Fig. 1, the main row of columns rise into cruciform apertures cut in the lower of two hanging ceilings. Round the upper edge of each opening is installed "Claude-Gen." neon lighting, in three colours, white, mellow, and old gold. Swivel spotlights for filaments lamps, are partially recessed into its lower surface.

Above this structure is the second false ceiling, in which bays extend outward on either side. The edge of each bay (one of which is shown in Fig. 10) is decorated by apertures of the cruciform shape, above which is located a second installation of three-colour neon lighting. These two lighting schemes provide the main lighting for the department Further lighting, fluorescent in character, is

provided at the end of the floor adjacent to the escalators. This is mounted in the upper false ceiling above a rectangular louvred aperture.

As on other floors, control of all lighting is effected from the corner switch panel. In general, distribution to lighting supply points is similarly arranged in trunking, transformer and control gear being housed in the spaces above the false ceilings. Column-base socket-outlets are also provided, those in the row of columns nearest the lifts being used to supply fluorescent lighting in fitting cubicles which are situated here.

The other major departure from the general pattern adopted for other departments is seen in the supply for the fifth floor, where the Store's two restaurants, together with a joint servery, is located. At the far end of the wing is the cafeteria, the larger of the two restaurants, which occupies the full width of the floor between the corridor and front of the building. Adjoining this building is the servery which extends the remaining length of the floor along its front side, being "L" shaped. The space left between the narrow part of the servery and the corridor is taken up by the "Mersey Room." As this restaurant is thus enclosed on all four sides, mechanical ventilation provides the necessary comfort conditions.

In the cafeteria, a double hanging ceiling arrangement has again been employed. Round the outside of the room is suspended the lower ceiling, on which are mounted circular "basin" type filament lamp fittings, fitted with spill rings. In the centre of the room is hung the upper false ceiling the effect being a large rectangular recess. This is illuminated round its edge by continuous lines of fluorescent lighting in three colours, mounted on the upper surface of the lower ceiling. In the centre of the rectangular section is suspended a composite lighting fitting which is decorative rather than utilitarian. It consists of a mesh arrangement, small filament lamp lighting units (similar in appearance to car side-lights), being fitted at alternate intersections of the mesh. Intermediate intersections are used for fixing suspension rods.

Fig. 6. English Electric 250 MVA, 11 kV main switchboard for the store, with the one MVA sub-basement transformer in the background

To supply the main fluorescent fittings, and the other units mounted on the lower ceiling, the wiring is run in trunking ringing the central aperture. From this is also taken the wiring for small fittings mounted on the columns. Projecting from each column above the tray cupboard, these fittings are inverted channel shape, the words "trays please" being cut in each side and illuminated by a 2 ft 40 watt lamp housed inside the channel.

At side of the cafeteria adjoining the servery is situated the serving counter, illuminated indirectly by fluorescent lamps mounted above the false ceiling. These units are also supplied from the trunking ring, together with a row of filament lamp fittings running the length of the ceiling directly over the counter.

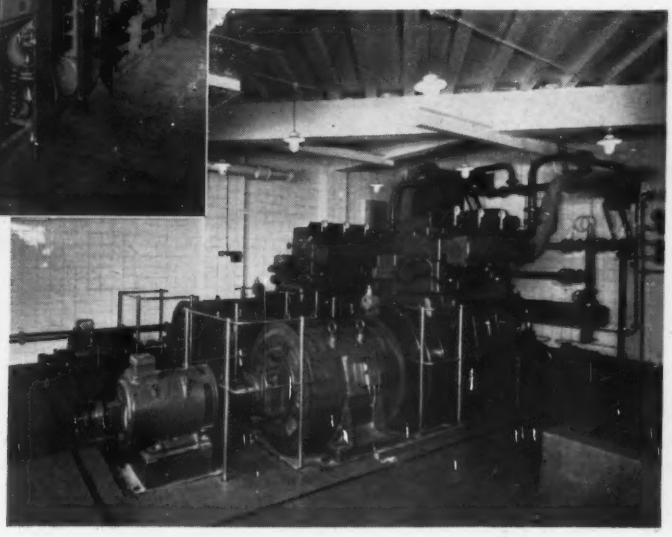


Fig. 4 (above) shows part of the sub-basement main l.t. switchboard and the cubicle board from which the diesel alternator sets (shown right in Fig. 5) are controlled, and emergency lighting and other services of the stores are supplied

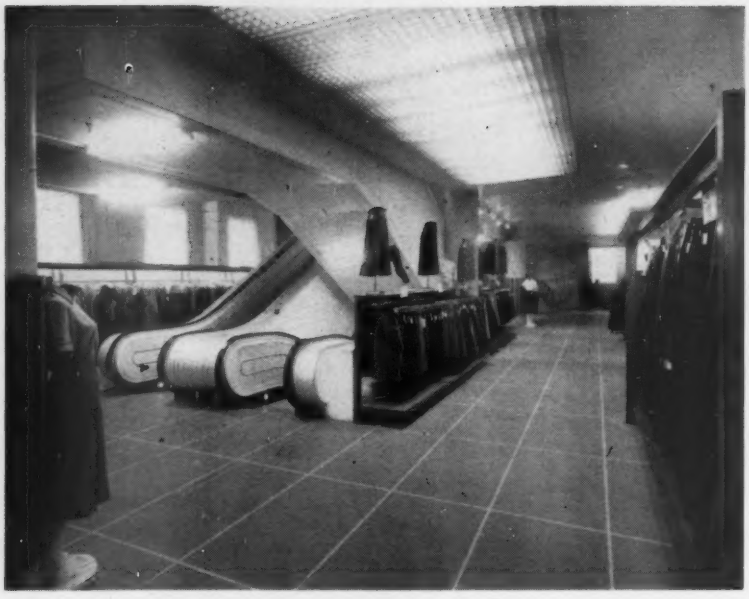


Fig. 7. Escalator and special louvred lighting fittings on the fashion floor

The cafeteria lighting is controlled from a switch panel mounted in the wall at the corridor end of the serving counter. From it are also supplied several wall mounted filament lamp fittings at the far side of the restaurant. Supply to it is taken in v.r.i. cables run in conduit in the duct above the corridor outside. These cables, together with those supplying two 5 kW plate cupboards behind the serving counter originate at "Superform" dis-boards (by the English Electric Co.) supplied in the normal manner from the rising bars.

Features of the Mersey Room

Decorations and lighting in the "Mersey Room," designed by the Design Research Association under the supervision of Nuscha Black, also makes use of the hanging ceiling effect, shown in Fig. 8, there being a central section set at a higher level than the surrounding edge. Three-colour indirect lighting for this part is in "Claude-Gen" neon tubular lamps running round the upper surface of the lower ceiling, in which filament lamp fittings are also mounted. Transformers and control gear for the former are located above the ceiling at four positions round the room. Access to it is gained, on one side, from the corridor and on the other from the servery.

Complementary lighting is provided by three lines of single-colour flourescent lamps round three sides of the room. Mounted above the lower ceiling, they are screened from view by louvres fitted between this ceiling and the panelled wall. Supply is run in a ring trunking whilst access to the lamps is gained through the louvre.

Additional decorative lighting is obtained from small fittings mounted on a handrail. This runs on two sides of the room to portion off sections where the floor level is some 6 in. higher. Here supply is taken from a socket-outlet mounted in the "step," this being fed by wiring run down an adjacent column and under the raised floor.

As in the cafeteria, supply for the room is taken from the rising bars through a dis-board near the take-off point. From here, v.r.i. cables, run in trunking over the corridor, supply the room, all switches being mounted on a single concealed panel. Corridor lighting is also supplied from the take-off from the rising bars taken from a dis-board in the switch room. All wiring for the fittings, of the glass sphere type for filament lamps, is run in trunking in the duct above the ceiling. They are controlled from a flush switch-panel mounted adjacent to the switch room.

From another dis-board in this room is supplied the servery lighting, which is effected by tungsten filament lamp fittings. From the dis-board, all wiring is in "Pyrotenax" m.i.c.s. cable, being run on the surface in the servery itself. A switch box near the door houses all switches controlling the fittings.

Similarly all lighting on the sixth floor and in roof building is supplied from the bars at fifth floor level. A cable carries the main supply to the dis-board in the lift-room on the sixth floor, from which "Pyrotenax" cables radiate to the two kitchens, staff canteen and roof. In the kitchens, tungsten filament lighting identical with that in the servery is employed, whilst in the roof "penthouses," filament lighting with vitreous enamelled reflectors is generally found.

In the staff canteens, however, is to be seen another variation in the lighting arrangements. Here the "Frenger" ceiling has been employed. Fitted flush in the ceiling are two lamp fluorescent lighting fittings of Courtney Pope manufacture, each surmounted by louvres.

Apart from an additional supply on the fourth floor and to toilet rooms, the foregoing is the total installation sup-

Fig. 8. The attractive "Mersey Room" designed by Nuscha Black, showing the ceiling's indirect lighting in three colours

plied at present from the rising bus-bars. This fourth floor take-off serves a hairdressing salon, the supply being taken direct from a separate t.p.n. isolator in the switch room, using a four-core, 19/·083 p.i.l.c.s.w.a. cable feeding dis-board. It supplies power for hair drying and other equipment of total connected load 30 kW.

Upper Floors' Power Supplies

Power requirements for the fifth and sixth floors and the roof installation are met by separate supplies taken directly from the main h.t. switchboard in the sub-basement. From an o.c.b. on each of the two bus-sections of this board a three-core, 19/·064 p.i.l.c.s.w.a., h.t. cable of the non-bleed type is carried in the rising bus-bar duct to the sixth floor where one cable terminates at the primary side of a pair of 300 kVA transformers operating in parallel. The other cable is taken to the roof where it feeds a similar transformer pair housed in one of several "penthouses" erected for electrical and other equipment. On both floors, the l.t. side of the transformers is connected by way of eight 0·5 sq in. p.i.l.c. cables to an English Electric switchboard. From the bus-bar side of the sixth floor board, however, four 0·75 sq in. p.i.l.c. cables are run to a bus-section coupler on the roof-board to permit emergency operation of both boards from one supply.

From the sixth floor switchboard, installed in the main lift room (Fig. 12), are supplied the Store's fourteen lift motors. Eight of these are housed in this lift room, the commissioning of the last two machines being due to take place shortly. These lifts serve all floors in the main wing down to the basement, and are each powered by a 28 h.p., 245 V d.c. slow speed motor supplied from a rotary

Fig. 9. One of Lewis's departments showing the type of lighting fitting in use. Note socket-outlets at base of column

convertor in the conventional manner. Supply to each motor control unit is taken separately in three-core, 19/·064 v.r.i. cables run in 2 in. conduit from a 150 A t.p.n. fuse switch on the board. Of the remaining six lifts, four are sited in the far wing, which it will be remembered, is to be refitted.

From the roof substation power requirements for the kitchen and servery, together with other services installed on the roof, are supplied. The kitchen and servery are equipped with both steam and electrical cooking equipment, whilst a small proportion of gas heating is also employed to guard against power failure. The total connected electrical load is approximately 450 kW. For the kitchen serving both public and staff restaurants, and the servery, two four-core 37/·083 p.i.l.c.s.w.a. cable is run to the main dis-boards. From

Fig. 10. Lighting on the fashion floor, showing the "bays" in the second hanging ceiling round the upper side of which three-colour neon lighting is fitted

here "Pyrotenax" m.i.c.s. cables, run on the surface, supply various items of cooking equipment, food preparation machines, the two 1 h.p. motors powering dish-washing machines in the servery, service lifts and the kitchen installation.

To complete the equipment supplied from the roof-board are two ventilation systems. Both are operated by vee-belt driven fans, the first, a 20 h.p. installation supplying clean air to the "Mersey Room." The other is a 70 h.p. air extraction plant serving this room, the kitchen and servery.

Sub-basement Power Distribution

It is in the sub-basement, however, that most of the auxiliary equipment for the stores services is installed. For its extensive power and lighting requirements a three-core, 19/·083 p.i.l.c.s.w.a. h.t. cable is fed from one of the o.c.b.'s on the main board to a 1 MVA delta/star transformer which transforms the supply voltage down to 440 V. From the secondary side, the star point of which is solidly earthed, two feeds in 127/·103 v.r.i. cable are taken to the two incoming 600 A air-break isolators on the basement sub-main board.

In common with all main switchgear this is of English Electric manufacture (Type O.B.2) and supplies two emergency supply bus-bar sections through bus-couplers apart from outgoing switchgear. The board serves a twofold purpose, controlling the store's two diesel/alternator sets for emergency supplies to all floors, and power and lighting circuits in the sub-basement. It is part cubicle pattern (for emergency supplies), part industrial pattern board, as shown in Fig. 4, and is so arranged that essential power supplies, as well as the emergency lighting can be supplied if necessary. To it is also connected a 300 kVA static p.f. correction capacitor.

Considering only the normal supplies, this board supplies twelve main sub-circuits for equipment in the sub-base-

Fig. 11. This shows clearly the bank of trunking from the switch room in which supplies for the floor's lighting and socket-outlets are run

ment and requirements on other floors not served by the store's main distribution system. For the pump room and adjacent boiler house, supplies are taken in a 19/·083 p.i.l.c.s.w.a. cable from a 300 A, t.p.n., cartridge fuse switch looping in to the pump room dis-board.

From the latter are supplied pump motors for hot water circulation and the steam heating system, wiring to motor control boards being in "Pyrotenax" m.i.c.s. cable. For water pumping, two 2 h.p. motors are used, one as a standby. Similarly, two 2½ h.p. motors power vacuum pumps for the steam heating return, one again being kept as a standby.

In the boiler room itself, three bituminous-feed boilers, two of 5,000 and one of 9,000 lb/hr capacity are installed for hot water and steam heating and cooking. Motors are fed from isolators and starters mounted on a central control board "Pyrotenax" wiring being again used. Also from this board are controlled the 15 h.p. i.d. fan for the large boiler, and two 4 h.p. sump pump motors. Due to the nature of the fuel (creosote pitch) which at room temperature would be virtually solid, electric heating is required. In the two fuel tanks, two 9 kW immersion heaters are fitted, whilst in the main fuel line is another 9 kW heater together with mains and lower (50 V) voltage tracer heater lines. All heaters are controlled from the boiler room control board, in which is also found the lighting dis-board for the 100 W filament lamps in use.

As two floors of the store are located below ground, ventilation plant is also found in the sub-basement. This comprises plenum and extract fans powered through a Heenan and Froude dynamic coupling. Air taken from the atmosphere is initially washed and steam heated before being circulated to the basement and sub-basement. Power for the fan motors is taken in four-core 37/·083 p.i.l.c.s.w.a. cable from a 300 A t.p.n. c.f.s. on the sub-board to the dis-board and starter panel in the fan-room, although control of the fan speeds is effected from a special control panel in the Engineer's office. By virtue of the dynamic coupling, infinite control of fan speed from zero to 95% (approximately) of the motor speed is obtained.

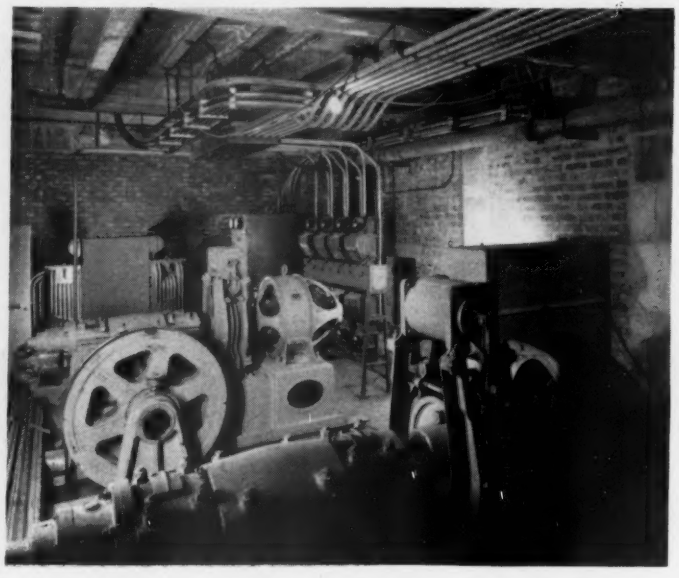


Fig. 12. One end of the lift room, showing the sub-main switchboard for the lift motors and the transforming station for the upper floor power supplies in the rear

Supplies for Pumping Motors

Further supplies are taken, one from each bus-bar section, for pumping water for the automatic sprinkler valve system, which is installed throughout the building. Its action is fully automatic, so that when any one of the sprinkler valves is opened, the pressure drop in the system trips the starter, thus pumping water immediately into its main storage tank. Another automatic pumping system has been installed for the cold water system, a 5 h.p. motor, and its standby, being installed to ensure the main storage tanks on the roof maintain an adequate quantity of water available. Also supplied from the same dis-board is a soiled water disposal plant. Here compressors powered by 5 h.p. motors return all soiled water through ejectors to the City's sewage disposal system.

Three installations located on higher floors are supplied from the sub-basement board, as their siting in the store does not permit their incorporation in the main distribution system. From each bus section of the sub-basement board is supplied a three-phase splitter for window lighting. Each is located in the sub-basement, being fed by four core 19/·083 p.i.l.c.s.w.a. cable from 150 A t.p.n. fuse switches. From each runs in 19/·064 v.r.i. cable in 1½ in. conduit are taken up inside the window back. These terminate in switch and fuse boards, which are either 12 or 15 way depending on the number of points to be served.

On a similar basis power for ten 15 h.p. escalator motors is supplied, four-core 37/·072 p.i.l.c.s.w.a. cable feeding two dis-boards from 300 A t.p.n. fuse switches. From each dis-board, supplies to each escalator is taken in v.r.i. cable, which is run in conduit up the side of the columns to the appropriate floor. Also supplied from the sub-basement board are sundry power dis-boards for each floor up to the sixth, the supply being run in three four-core 37/·083 p.i.l.c.s.w.a. cable to cable sealing boxes in the

basement. From each of these a vertical run of four v.r.i. cables in 3 in. sq trunking is taken up the far side of the building. Tee-boards on each floor provide supplies for any possible loads which may be required in the future.

Control of many services affecting conditions in the public departments is effected from a central array of cubicles (Fig. 3) located in the Resident Engineer's office adjacent to the sub-main board. In one cubicle temperature throughout the building is measured and controlled. A Negretti and Zambra temperature indicating instrument is connected through a multi-way switch to thermocouples located at various positions on each floor. Heating on all floors from the ground to the fourth is provided by unit

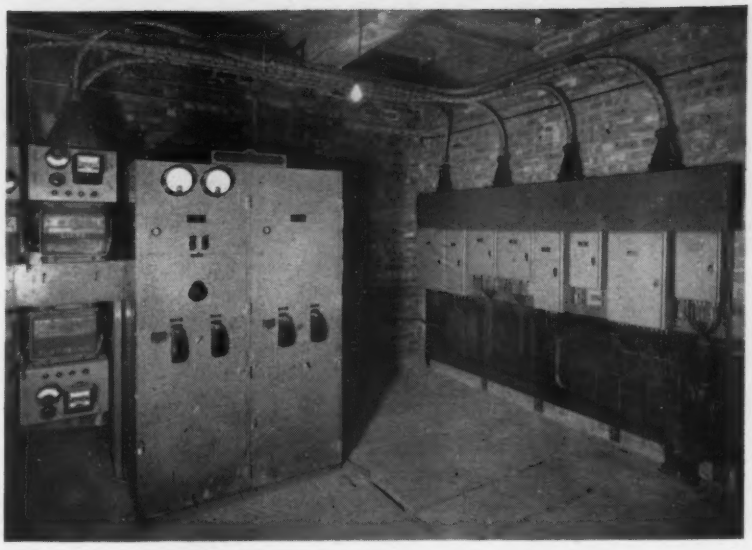


Fig. 13. Neatness is one of the features of this dis-board which supplies the kitchen and servery. On the left can be seen the main incoming isolator and bus section coupler for the switchboard

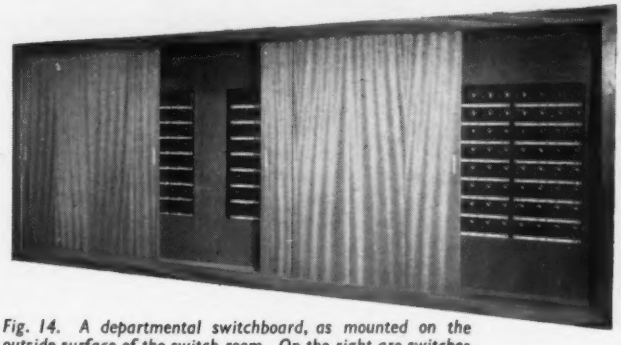


Fig. 14. A departmental switchboard, as mounted on the outside surface of the switch room. On the right are switches for lighting, on the left socket-outlets, with emergency lighting switches in the centre

heaters mounted in the web of ceiling beams. These are merely electrically driven fans circulating air through a steam-heated battery. The air temperature is thermostatically controlled, to operate motorised valves in the steam pipe line to each heater battery.

Apart from control of ventilation of the basement floor, cubicles are also provided for two further systems, one of which is a colour light personnel signalling system operated from the telephone switchboard. The other system supplies impulse driven slave clocks on each floor, from the master clock in the cubicle. On each floor a panel combines these two systems with public address loudspeaker units.

The other use to which the control board is put is that of auxiliary metering. Two instruments are provided in the cubicle, a recording ammeter and a maximum demand meter. The latter measures the demand at half-hourly intervals, recording at each operation the maximum demand during the previous 30 minutes. The supply authority's metering is carried out on a separate board in the h.t. switch room. It comprises three single kWh meters together with maximum kW demand and maximum kVA demand meter.

Emergency Lighting System

Turning now to the emergency supply, the prime consideration for which is, naturally, the safety of the public using the Store, the arrangements provide for two 110 kW diesel-driven alternators, supplying a limited number of carefully sited lighting fittings. These sets will start automatically on failure of the main supply. Control is effected from the emergency section of the sub-main board (Figs. 4, 5). On failure of the public supply, 2 h.p. diesel starting motors are automatically energised from batteries, which should ensure that both sets are supplying power to the bars in some 30 seconds.

Each alternator is connected to its bus-section through an incoming 600 A circuit-breaker, whilst a bus-coupler enables both sections to be operated from one set only if necessary. In the neighbouring cubicle are housed controls and voltmeters for the corresponding unit together with a synchroscope for paralleling the two sets. Each section is connected to, firstly, fuse switches supplying outgoing circuits, and secondly, a coupling switch which links its section to the incoming insolator on the sub-main board energised from the public supply.

For emergency lighting, fourteen pairs of 7/·044 cable are run in the trunking, two pairs branching off at each floor to a dis-board in the switch room. From here fittings are supplied in the trunking normally used, a 32 way switch and fuse panel being incorporated in the floor switch board. The trunking continues to the sixth floor, carrying a pair of 19/·044 v.r.i. cables for emergency lighting for this floor and the roof. A similar rising trunking system carries nine pairs of 19/·064 v.r.i. cables for the other wing.

Although the lighting circuits are energised on emergency only, several essential services are supplied normally from the emergency supply, using the public supply when the sets are not in use. This arrangement ensures that virtual continuity of supply is maintained. Foremost in this category is the supply to refrigerators, and other services so provided include lighting for stairs, entrances, and the sub-basement. To complete the arrangements, an emergency supply is also available for the roof sub-main board to provide means to operate a skeleton lift service and other services should it be necessary.

The engineering installation was carried out by Lewis's Ltd. under the direction of the Consulting Engineer, Oscar C. Waygood, O.B.E., M.I.E.E., and their Chief Engineer, B. H. Lambert, ASSOC.I.E.E., and to all due acknowledgment is made in the preparation of the article and for permission to publish.

Engineering as a Profession

Fundamental Considerations Which Underline the Claim for Recognition

By P. DUNSHEATH, C.B.E., M.A., D.SC.(ENG.), F.INST.P., M.I.C.E., M.I.E.E.

IT has frequently been pointed out that the progress of any movement in human affairs is not uniform, but that it takes place intermittently and at varying rates. The general advance over a reasonable stretch of time is clearly established but sometimes the curve, when examined in detail during a short period only, may show a temporary retardation. This phenomenon must be painfully familiar to those engineers who take thought for the status of their profession. At times they are discouraged by indications of the lack of public recognition. They see large headlines in the leading national newspapers announcing a strike of engineers when they know,—and feel that the educated editors of such publications should know—that the union in question is not an organisation for engineers. They see a trade union comprising a body of men who themselves would not dream of assuming the status of a profession using the name "engineer" prominently in their title. The indistinct figures clambering about in the gloomy lift-well behind the grill are announced to the public by a temporary notice on the gate as "engineers."

Taking a broad view, however, we need not be unduly concerned by these events. Today the general public appreciates more than ever before, that engineering is an established calling making high intellectual demands on its members. It is widely recognised that engineers carry a heavy responsibility for human safety, public health and a vast array of goods and services on which modern civilisation is completely dependent. Very few people today subscribe to the ancient "blue overall and dirty hands" myth: instead the community supports without reservation the spending of large sums of money on Universities and Colleges of Technology to ensure that the standard of education provided for engineers lags in no way behind that available to any of the other professions and industrialists and educationalists assemble together in conferences at the highest levels to maintain and still further advance this standard.

The broad scope of the professional engineer ranges from the many departments of the Civil Service at home and overseas, local government, various types of public authority such as the Electricity Authority, the Coal Board and the B.B.C., to the great world of manufacturing industry embracing research and development, design, operation, production and technical sales. Then again, overlapping many of these are the specialist fields of consulting, teaching and contracting.

It is obvious that the position of engineering as a profession cannot be discussed *in vacuo:* we must address our enquiry first of all to the broader question of what do we mean by a profession, and having satisfied ourselves on the general, proceed to the particular. Unfortunately as soon as we start to analyse the fundamental issues, we find a foundation which itself is a little shaky, and on which we must build with care and some reservations. The Oxford Dictionary definition, though much quoted during the past twenty years from Carr-Saunders onwards, can with advantage be invoked once again. "A vocation in which a professed knowledge of some department of learning is used in its application to the affairs of others, or in the practice of an art founded upon it." This, so far, is simple: we get specialised knowledge and apply it to helping other people. The dictionary proceeds, however, "Applied specifically to the three learned professions of divinity, law and medicine, also to the military profession." The date 1541 then appears at the end which, interpreting the conventions of the O.E.D., presumably means that divinity, law and medicine were professions from a date unknown and that soldiering became a profession in 1541.

Growth and Development

The lesson to be learned from the dictionary definition then would appear to be that what constitutes a profession is not settled once and for all time, but is ever open to new interpretations depending on the growth and development of specialised knowledge and its "application to others." Up-to-date experience completely justifies such a view. Notwithstanding the Oxford Dictionary, very few today would wish to withhold professional status from architects, accountants, biologists and a score of other callings including engineers. In each of these fields a corpus of knowledge has grown to such a stature as to justify a profession with a high prestige not only in its contents of learning but in its applicability to the welfare of others.

It is worth while considering in a little more detail what are the factors which justify the assumption that a particular calling is a profession. First and foremost of course those who practise must possess a high degree of competence in the particular branch of learning. This they will obtain by general education to a high level—ensured by a suitable standard of entry to the profession, specific education at university level and practical training in association with experienced members of the profession.

In the second place they must co-operate in a corporate life to expand the frontiers of knowledge through research and the dissemination of new knowledge: two quite distinct activities both of great significance.

A third factor which always assumes importance in this subject is the question of the maintenance of a high degree of integrity among the members of a profession. Standards of conduct for the protection of the client or of the employer have, from the earliest days, been in the forefront of the objects of the professions. The level of its public service and the extent to which the public is protected against selfish malpractices of the members of a profession are thus a measure of the extent to which a group justifies professional status.

As the building up of prestige naturally attracts competitors who seek the privileges of membership of a professional group, without undertaking the liabilities—sometimes irksome and involving personal sacrifice—the group must clearly organise on a protective basis. By the publication of its standards of entry and training and of its qualifications the unqualified outsider is kept at a disadvantage. All this calls for organisation to bring to a focus the many facets of what becomes a profession.

New-comers

In discussing the professional position of the engineer we must take care to observe what is going on in the world around us in the professionalising of occupations. The social advantages of being a member of a profession have, during the past few decades, becomes widely appreciated, and scores of new bodies have been set up in fields where the main characteristics of a profession are now felt to be necessary, although formerly such a need was never felt either for the sake of mutual help or for the sake of personal prestige. Examples which will come to mind are the Sales Managers Association, the Institute of Directors, and the Institute of Industrial Administration. A recent author has collected together a list of the various letters which members of this multitude of bodies write after their names: excluding university degrees but including the older professional bodies, the total number now exceeds one hundred and seventy. One of the most interesting phenomena in the modern technical college curriculum is the large number of courses in management studies now provided, many of them aimed directly at one of the new professional qualifications. Certainly engineering with its much longer tradition need feel no qualms over the Oxford Dictionary definition.

The Client Approach

The duties of a professional man are directed to his client, who formerly was almost universally an individual. Today the general medical practitioner still deals directly with the patient, so maintaining the personal client relation, whereas the municipal engineer advises a committee. The patent agent may act directly for an individual inventor or, in a large engineering concern, may be a member of a team with a client rather nebulously defined as the Board of Directors. Although the older personal relationship on professional matters still persists in many fields the corporate client is becoming more and more frequent.

An interesting conjecture is to determine the application of the former principles of professional morality to these nearer relationships. At first sight it might appear that the situation is completely changed, but on closer inspection it will be seen that so far as the attitude of the professional man is concerned the fundamentals still remain. He is remunerated by an organisation which requires his advice and help: he must give this advice in the best interests of the client without taking personal advantage of the situation himself or allowing any outside party to benefit from the transaction against his client's interest. An industrial patent agent would not take advantage of the information given by a department of the firm employing him by filing an application himself, nor would he divulge details to another client or to an outside person. It would obviously not be considered good professional conduct for an architect to have an important interest in a brickworks supplying material for a house he was erecting for a client, and this would apply equally to both personal client and corporate owners.

The Engineering Profession is Different

It will already have become apparent that so far as engineering is concerned professional ethics becomes a confused subject. The majority of professional engineers work as members of a team, and make contact with the "client" through colleagues higher up in the hierarchy of the concern by which they are employed. If, as has already been suggested, the professional status largely hangs on a code of business ethics, then we are faced with a difficulty at once because we naturally expect the members of a subprofessional class also to conduct themselves with a reasonable moral approach to their daily duties. A winder working on a large electric generator carries a considerable personal responsibility for straight dealing. Unless he directs his knowledge and ability honestly the client may ultimately suffer through failure of the equipment. To justify professional status therefore we must postulate more than honest dealing, and here we are brought face to face with the educational factor: professional status must rest on the combination of the highest educational standard with an unimpeachable morality.

One essential difference between engineering and the medical profession is in the demarcation between the qualified and the unqualified. For nearly a century the British Medical Association have made it quite clear who are the members of the profession and who are not. In engineering we have seen the disintegrating effect of a phenomenally rapid growth and, during the same 100 years splintering and proliferation have resulted in a large number of professional engineering bodies aiming more and more at specialised fields. The start came with the breaking of the Mechanicals from the Civils followed by the Naval Architects and later by the Electricals. Although the three major Institutions still retain the highest prestige and numbers, the splintering goes on—structural engineers, chemical engineers, production engineers, and so on. Today there are some twenty institutions in this country claiming with varying degrees of justification professional status in engineering and the qualification acceptable for employment as an engineer range over a wide field from a university degree, through national certificates and diplomas to the corporate membership of the more established and nationally respected bodies.

Definitions of Professional Engineer

The most famous definition of a professional engineer of course derives from the one used in the charter of the Institution of Civil Engineers dating from 1828 "the art of directing the great sources of power in nature for the use and convenience of man. . . ."

Various later definitions have been proposed and much attention has been given to the question during the past few years. The latest one is that agreed at a meeting of representatives from the engineering societies of Western Europe and the United States in Paris a few months ago.

"A professional engineer is competent by virtue of his fundamental education and training to apply the scientific method and outlook to the analysis and solution of engi-

neering problems. He is able to assume personal responsibility for the development and application of engineering science and knowledge, notably in research, design, construction, manufacturing, superintending, managing or in the education of the engineer. His work is predominantly intellectual and varied, and not of a routine mental or physical character. It requires the exercise of original thought and judgment and the ability to supervise the technical and administrative work of others.

His education will have been such as to make him capable of closely and continuously following progress in his branch of engineering science by consulting newly published works on a world-wide basis, assimilating such information and applying it independently. He is thus placed in a position to make contributions to the development of engineering science or its application.

His education and training will have been such that he will have acquired a broad and general appreciation of the engineering sciences as well as a thorough insight into the special features of his own branch. In due time he will be able to give authoritative technical advice, and to assume responsibility for the direction of important tasks in his branch."

It is striking to notice the complete absence in both these definitions, that of 1828 and the recent one, of any reference to the ethical relations between the engineer and his client or employer and it may be that this is accounted for by the difference, discussed earlier, between the engineering profession and other professions; not that the relationship is unimportant, but rather that it is implied in the conditions of employment.

The Engineers' Guild

It might reasonably be thought that, with the many ramifications of modern engineering, common action in securing the necessary organisation to establish a profession of engineering would be quite out of the question. There might be a class of professional civil engineers, or of mechanical or electrical engineers, but how would even this be possible without recalling to the fold the many splinter groups? Time has, however, shown what can be achieved by a policy embracing the Institutions of Civil, Mechanical and Electrical Engineers. In 1938 a meeting of engineers inaugurated the Engineers' Guild with a membership restricted to corporate members of these three Institutions. The Guild claims for the engineering profession parity of status with any other profession basing the claim on the possession by every member of a general qualification of a high standard with which the membership of the Institutions of Civil, Mechanical and Electrical Engineers is accepted as complying. The Guild is now very active and has branches throughout the country from which representatives attend General Council meetings.

Prominent among the Guild's objects is the promotion and maintenance of the unity, public usefulness, honour and interests of the engineering profession. Professional interests are not neglected, so questions of remuneration find a place in the programme.

After investigation the Engineers' Guild decided some six years ago not to become a trade union but to be incorporated under the Companies Act. Sensing the view that professional engineers would not wish to adopt the methods of a trade union in the regulation of relations with employers, and finding that in other professions questions of remuneration had been successfully handled through general support of the profession the Guild went forward in 1951 to incorporation, under Companies Acts.

Over a wide variety of professional interests the Engineers' Guild has already taken action, and in many ways has expressed its appreciation of the professional status of engineering and its interests in the many personal problems on a confidential basis. There can be no question but that the association between the Guild and the three major Institutions in a field in which their own charters would not permit them to take individual action is a vital factor in the profession of engineering today. It must be stated however that although the Guild is very active and has branches throughout the country its real effectiveness lies in the future and is very dependent on a much larger proportion of professional engineers joining its ranks.

How Status Comes

The achievement of status by a profession is effected in two ways. In the first place the standing in the community of any body of men depends, more than we sometimes think, on the behaviour and bearing of individuals known to be members of that body. Whether we understand the curriculum behind P.P.E. or not, we shall not meet many people who have passed through the course without coming to the conclusion that Modern Greats at Oxford must stand high in educational equipment. For similar reasons we look a second time at the candidate who writes "Dockyard Apprentice" on his form of application for the job which we are filling. We have seen others of the breed, and know that they are good.

The second main factor is the building up of a professional body whose name can similarly carry corporate credit through its known achievements not only on behalf of its members but for the community. Few need to be told what B.M.A. stands for, even outside the medical profession. The newspapers know and they let the public know. When the professional engineer becomes news through his personal influence and that of his protecting society, then will the profession begin to rise to its full stature and no more will status need to be sought.

Rural Electrification School

IF EACH area board could assemble a staff of competent and well trained men who would get out and interview farmers, and advise and encourage them in the use of electricity on the farm, a very substantial load could be built up in rural areas. This is the conviction of Mr C. R. King (Chairman, E.M.E.B.) as expressed at the opening session of the E.D.A. vacation school on rural electrification which took place at the University of Nottingham School of Agriculture this week.

The need was to convince the farmer that man-power-hours could be saved by using the supply of electricity for every possible purpose. With a farm labourer costing the farmer £300 a year or more, if the farmer could be persuaded that he would be saved "half a man" at a cost for electricity of, say, £100 per year, the proposition should seem attractive to him. For the electricity boards, the use of £100 worth of electricity yearly on 200 and 300 acre farms would ensure that rural schemes paid.

In a later paper at the School, Mr E. C. Claydon (Agricultural Engineer, Eastbourne Sub-Area, S.E.E.B.) spoke on applications of electricity to farming. He noted that only 10% of the dairy farms that employed milk cooling had refrigerated coolers, and suggested that this offered tremendous scope for development.

Electric pumping sets could give economies over mains water where a suitable source of water was available while the electric hammer mill had proved a money saver.

In conclusion, Mr Claydon suggested that those electricity boards which had interested themselves in rural development had no reason to be satisfied with results to date. The S.E.E.B., for instance, had an average consumption per farm of 6,252 units/year.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Thermostats for Motor Protection

I FOUND the article by Mr Blanchard in the issue of 10th December most interesting, but I would suggest that the form of protection described does not reach the ultimate ideal. It is the insulation of the windings which has to be protected against high temperature, but the protector described produces only an imperfect thermal picture of the winding temperature.

In the case of fractional horse-power motors I am quite sure this compromise is the best which can be obtained, because of the small dimensions of the windings. However, for larger motors the aim should be to disconnect the motor from the mains by means of a device directly affected by the winding temperature.

The Brown Boveri organisation, with which I am associated, have employed Mr Blanchard's principle for the protection of high voltage transformers, where it is not possible to place a protective device in contact with the windings, but in the case of motors they have approached the ideal by building the thermal switch into the winding.

Mr Cobbold, whose letter appears in the issue of the 17th inst., will be pleased to learn that this form of protection has been used successfully for some years in motors from ½ h.p. to 100 h.p.

R. H. Coates.
BRITISH BROWN BOVERI LTD.,
LONDON, S.W.1.

* * *

REFERRING to Mr Blanchard's article on motor protection thermostats in your issue of 10th December and to Mr Cobbold's letter in the following issue, I suspect that the reason why this form of protection is not generally applied to large motors is that due to the greater thermal capacity of the carcase, the surface temperature may not rise to a sufficiently high level to operate a thermostat satisfactorily even when a "hot spot" in the windings has reached a dangerously high value.

The solution would of course be to embody the thermostat within the machine at some suitable point, and I believe that this has, in fact, been done.

E. Bartlett.
LONDON, W.C.1.

Fluorescent Street Lighting

HAD the first paragraph of my previous letter on this subject been published in its entirety, the motive for my criticisms may have been discerned more clearly: I share with Messrs Weston and Grundy the desire for improved street lighting but, as a taxpayer, cannot accept the implication that fluorescent lighting should be adopted exclusively. The further examination of costs now being conducted ultimately may necessitate second thoughts but the evidence available at present tends to favour sodium.

My remarks concerning the advantage of sodium in fog have been misunderstood. I do not advocate this type of lighting for that reason alone though such conditions are normal to many parts of this country at certain seasons. It seemed appropriate, in the circumstances, to mention this compensating feature—unscientific as it may be—in order to off-set the objections of those who are unduly colour conscious.

The authors themselves state that "objects can be seen more clearly in sodium light than in any other." This suggests that the aversion to sodium is founded not particularly on its imperfect rendering of colour but on the effects produced by cumulative glare. Sodium, undoubtedly, is inferior to fluorescent in this respect but comfort is restored with the introduction of suitable lanterns.

Photography, as a means of comparing installations, is fraught with complications. For instance, what adjustments are made when dealing with light emissions of differing wave-lengths? I imagine the sensitivity of the film is affected to some extent by the periodicity of the light to which it is exposed.

An examination of the detailed cost statement for the fluorescent installation reviewed shows that maintenance charges for the periods 1st October, 1950, to 30th September, 1951, and 1st October, 1951, to 30th September, 1952, totalled approximately £255 and £490 respectively, while the ratio of expenditure for the last six months to that for the first six months in each of those periods is of the order 0·8/0·7, from which I surmised that the total cost for the period 1st October, 1952, to 30th September, 1953, would be in the region of £560. The re-painting undertaken puts a different complexion on the matter, however, but it would be interesting to discover how my calculations compare with the actual figures which, presumably, are now available. I am glad the authors are continuing their investigations because cost is important.

"1066"
CHESHIRE.

* * *

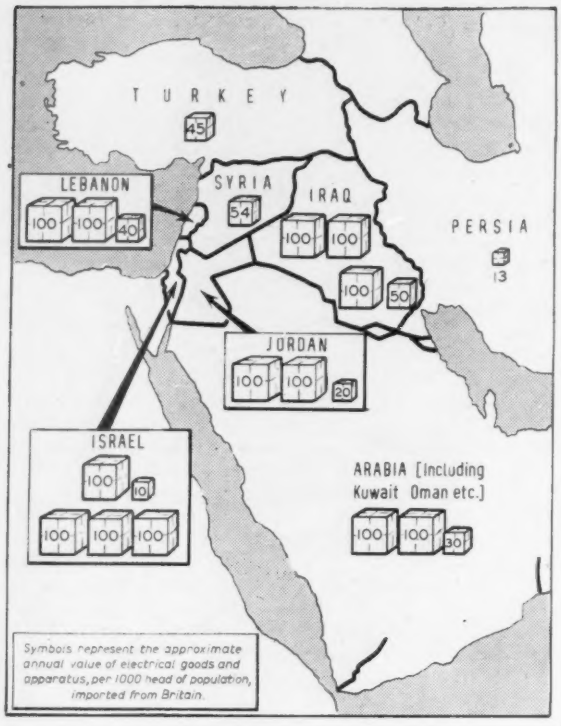
AS a motorist, I am naturally always interested in street lighting and I feel I must take slight issue with "1066" in his letter of 10th December, when he stresses the advantage of sodium vapour in misty or foggy conditions. While this is to a large extent correct as far as a comparison with mercury vapour is concerned, I have noticed during the recent misty evenings that the fluorescent installation in Brompton Road provides remarkably good visibility. The same phenomenon was apparent at Cambridge when I was there some time ago, and in the latter case a fairly close comparison was possible between the sodium installation on the town's outskirts and the fluorescent installation in the town centre.

C. Wagland.
RICHMOND, SURREY.

CIGRE - 1954

PRELIMINARY details of the 1954 International Conference on Large Electric System (CIGRE) have now been issued in Bulletin No. 1 (15th Session). The date of the Conference will be from 12th May to 22nd May, and as in previous years, the venue will be at the Fondation Berthelot, at 28 *bis* Rue Saint-Dominique, Paris. The opening ceremony will take place on Wednesday, 12th May, at 4 p.m., and the closing ceremony on Saturday, 22nd May, at 11 a.m.

Registration fee for the 1954 Convention is 20,000 French francs, but this may later be increased by 10 or 15 per cent owing to the continuous rise in prices. For permanent members, the registration fee is reduced to 16,000 francs, and when the "permanent member" is a society or organisation sending several delegates, five of these delegates will be entitled to this reduction. Remittances should be sent to the Secretariat of the CIGRE National Committee of the country concerned. In Great Britain, this is located at Thorncroft Manor, Dorking Road, Leatherhead, Surrey, and the secretary is Mr R. A. McMahon, M.I.E.E.



SMALLER OVERSEAS MARKETS

they are vital to British Exports

By E. G. LENNARD, M.I.EX.

A POST-WAR world, starved for six and more years of all but the most essential supplies, presented many golden and glorious opportunities for export-minded manufacturers, the electrical industry being no exception. Some eight years have now gone by and a very different set of circumstances is with us, and to assess this properly it is necessary first to study the changing conditions over the past years particularly keeping in mind two basic factors.

First, in the last full pre-war year (1938) electrical exports amounted to £23 millions; secondly, one must not consider only manufacturers' export departments, but also the many export, shipping and confirming houses, who between them account for 60% of U.K. exports (forgetting the incidence of indirect or re-exports). The electrical industry, particularly on the "lighter" side, on which this article will concentrate, is probably no exception in this respect: in fact it may well be that the relative figures will prove to be somewhat higher than for exports in general.

It reflects well to the industry's credit that post-war opportunities were seized to great advantage. If at times there were indirect measures, such as stipulated quotas for the home market, restrictions on use of certain materials other than for export goods and so forth, then this should not detract from the overall achievement. After all, there have been and still are times when we compete with manufacturers in other countries who are helped by all sorts of "incentive" schemes which are no less Government-inspired than the above mentioned indirect measures.

The Export Task

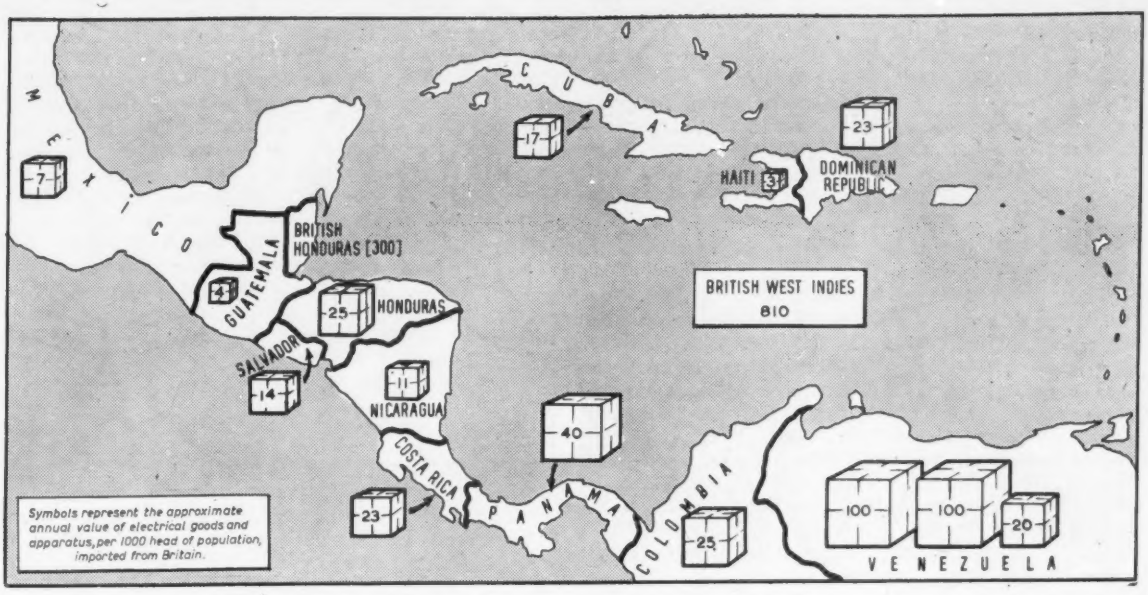
Mr Maxwell Buist, Export Director of the British Electrical and Allied Manufacturers' Association, at a recent meeting in London, stated that in 1952 the electrical industry's exports were worth £220 millions, truly a remarkable figure. Thus an almost tenfold increase in export sales compared with the pre-war figure must be set against the 100% increase in the country's overall production. This underlines better than anything else how the post-war opportunities which offered themselves were exploited as best they could. Incidentally, Mr. Buist mentioned that in his opinion the ratio between home and export sales should be about 60/40 and stressed that a sound home market was essential in order to enable us to retain and consolidate export sales absorbing 40% of our factories' output.

At the time when "anyone able to lay hands upon consumer goods could sell them almost anywhere," the jealous home sales manager without stocks to sell probably exaggerated the easy (as he thought) task in front of his export colleague, who was the blue-eyed boy of those times. How different is the picture today!

It was inevitable that saturation point would be reached one fine and sorry day; it was equally inevitable that sooner or later competition from ex-enemy countries would have to be faced; once the vanquished had their factories and workshops in full swing (more often than not with our help and connivance, absurd to relate) and once so-called neutrals and victors had overcome their initial, psychologically well understandable reserve. Let us remember also that some pre-war agricultural countries suddenly turned up in the role of consumer goods producers, that a goodly part of the world is screened from us by a man-made iron curtain, that balance of payment difficulties are not exclusively confined to this country and that others, too, have to take restrictive measures which are definitely not to our liking. With such factors operating, there remains a picture as first we saw it about two years ago, possibly sooner; a picture that would have been manifest sooner but for the impact of the Korean war.

End of the Boom

The sudden imposition of import restrictions in Australia and New Zealand was only one out of many danger signals. It had been preceded by similar difficulties in the far east; it was soon to be followed in other common-



wealth countries. Its impact proved infinitely larger and caused many vociferous protests which, though far from bringing immediate relief, were probably useful in showing the tremendous importance attached to the markets in question. In some instances it has taken the best part of two years or more to re-start shipments and it will be a long time before the position will resemble anything like that of the previous years. In these circumstances, the hard-pressed export manager or merchant was forced to employ initiative and ingenuity, some, possibly, for the first time since the war. It was at this juncture that many a thought turned from the "easy" commonwealth to the infinitely more difficult and genuinely "foreign" markets. Some wise and far-seeing exporters had already anticipated the turn of events and secured a foothold in some of these "foreign" markets. However, they were in the minority and there can be few who shipped prior to 1951 all that could have gone to the lesser-known overseas markets.

Because by this time the amber and red light could also be seen in the major South American republics, the position really looked desperate. Energetic efforts, mainly through personal visits to the countries and patient negotiation resulted in some success, and no doubt every manufacturer has his own story to tell. To give but one or two examples; there are the refrigerator manufacturers whose exports to Turkey bounced up to such an extent that they were limited only by their own or their agent's inability to find further finance (for lack of foreign exchange and import licences these exports are back to nothing today, but at the time were a very comforting "stopgap"). Exporters of refrigerators to Italy broke into a market against local, American and other competition and were so successful that a position was consolidated which few could have had the foresight to predict three or four years earlier. Again, there is the electric iron manufacturer who through force of circumstances simply had to get down to the issue which had been with him for many years but which he never squarely faced, namely, to so modify his existing model that it became acceptable in one of the Scandinavian countries with their stringent electrical requirements (which so many of us believe have been designed to keep us out of Scandinavia but are in point of fact little else but a copy of pre-war German specifications which the latter managed to spread like a gospel). Having made the necessary modification Scandinavia proved the best export market out of all the 50 or 60 overseas territories to which he sends his wares.

While for some these new outlets may provide excellent opportunities obviously this cannot be the case for all. It is unfortunate that the change in export demand should coincide with an industry's readiness in capacity, manpower, modern machinery, skill and tools. But how to arrest the downward trend in export sales, in 1953 only some 5–6% lower (estimated) than in 1952? There is no mistaking the fact that we have reached the top of the wave as far as electrical exports are concerned and must face up to some decline. This decline at the time of writing is far more serious than the cursory study of statistics would have us believe. On the one hand export of electrical goods continues to compare favourably with that of other industries which have been vital contributors to our overseas income. On the other, it is necessary to appreciate that electrical machinery exports continue to run at more or less the same level as before, being as it were the result of orders placed several years ago. Such exports conceal the fall in domestic goods (refrigerators, washing machines, vacuum cleaners, cookers, heaters, lighting fittings and accessories) which have already dropped by approximately 25% on 1952 figures. It is an infinitely worse position than is generally realised, consequently the electrical manufacturer's export department and the export merchant will have to seek new opportunities overseas and give their best to turn them to advantage.

Caribbean Trade

Fortunately, they can look to the Board of Trade for something more than meaningless phrases ("export or die" surely is a little drastic for most people's taste). Some 12 months ago, in November/December 1952, a mission led by Brig. Crosland and composed of prominent business men, a banker and an engineer, visited the Caribbean (Colombia, Venezuela, Dominica, Cuba and Mexico) to explore fresh trade possibilities for us. Ultimately a report was published by the Board of Trade, under whose auspices this tour was undertaken. This is neither the place nor the time to quote from it or to paraphrase it. Suffice it to say that any export-conscious person who has not read it yet should do so without delay—unquestionably it should benefit him and his firm.* Obviously it is too early to see

* "Markets in the Caribbean," H.M. Stationery Office, 4s. 6d.

a tour of this kind with its concise recommendations, particularly for general trade and the engineering industry, translated into the realm of Trade and Navigation Accounts, as these invariably lag behind by many months. However, the writer has before him one manufacturer's export figures in respect of one electrical appliance only and based on January/June 1952 equals 100 these show the following increases:

January/June 1953: Venezuela 210
Colombia 480
Mexico 270

The Middle East

This tour is by no means the only lead from the Board of Trade of use to exporters. The Caribbean mission experiment which turned out to be so useful, is at the time of writing being repeated elsewhere. A Trade Mission composed of prominent business men and with Sir Edward Benthall as leader arrived in Baghdad on 15th November and is visiting such Middle Eastern commercial centres as Kuwait, Damascus, Beirut, Jedda and others. Eventually this mission, like its predecessor, will publish a report, and this again should contain much of benefit to exporters in general, and the electrical industry in particular.

It is difficult to anticipate a report of this kind but one can be reasonably certain that whilst great opportunities do exist in some of the countries under review, others will show up our efforts rather badly, notably in the Lebanon and Syria. In these countries our overall exports (up to 30th June, 1953) were almost one-third lower than in the same period of 1952, although in conformity with the pattern mentioned earlier, manufacturers of electrical goods and apparatus fare somewhat better, exporting at 86% and 70% respectively of the 1952 level. At the same time German exports to these two countries were up by 40% possibly as a result of political factors working in favour of Western Germany. Due regard must also be paid to the energetic German sales measures, such as the granting of liberal credits, investments, the despatch of advisers and travellers (who inter alia can do much to influence design and styling) and last, but not least, trade missions.

Bright features of the report will undoubtedly be the oil-producing territories and outstanding amongst these will be Bahrein and Kuwait which, for electrical goods etc., show a 100% increase (first nine months of 1953) over the corresponding period for 1952, a year which in itself presented a record achievement surpassing all previous years. Far from displaying satisfaction with such results manufacturers will undoubtedly be asked to consolidate and extend our position in these valuable countries which for some time to come will look towards the U.S.A. and the U.K. for help and assistance in developing their natural resources and, presumably, can be expected to purchase our goods in exchange for the royalties we help them to earn. It is fairly obvious that saturation point is a long time off in these territories, but we cannot afford to disregard an eventual free convertibility of the pound nor the fact that with any eventual re-establishment of diplomatic relations with Persia, the flow of oil from Bahrein and Kuwait will not continue to increase at the same rate as in recent years, if indeed it can be maintained at all at the 1952–53 levels. In either eventuality we should take steps to become so firmly established in these markets that it will take more than a depression or currency difficulties to drive us out.

The Task Ahead

Irrespective of such speculations, however, the lesson to be learned from our many diverse experiences in the overseas markets since the war, is not to put all one's eggs in one basket. If sheer necessity has forced us to seek and explore fresh outlets, then it is our own fault that we ever let things come to such a pass that we had to scurry round the four corners of the globe in order to find markets for the products of our factories and indeed to keep our factories going. For the majority of those engaged in export it is now easy to see that we should never have been content with bulk shipments to, say, Australia, South Africa or India, but should have used those immediate post-war years to develop our sales to the smaller countries.

Now that we are entering these smaller markets (or at least recognise their importance) it may be hoped we shall go all out to stay in them, in good times or bad, and not desert them for seemingly bigger and riper plums which may dangle before us occasionally. Everyone knows that it requires just as much clerical work to ship fifty refrigerators to South Africa as it would for five to Bahrein and consequently a better return is obtained. None the less, it should be our endeavour to intensify our sales efforts and streamline internal administration so that we can make these smaller shipments with the same sort of monetary return. Trading with the smaller countries requires a new concept of export policy, a concept which is vital to us as manufacturers, as traders and as an industrial nation.

B.E.P. Convention Programme

PROMOTION and development of home and overseas markets for electricity is to be the theme of the sixth British Electrical Power Convention, to be held at Eastbourne from 14th to 18th June this year. This is announced in the preliminary programme of the Convention, issued this week and summarised in the table below.

This year the exhibition is to be housed in a marquee, for the first time since the Torquay Convention in 1948. The marquee will give 24,000 sq ft of space, about 20% greater than was available last year. Erected in the grounds of the Winter Garden, the exhibition marquee will be within 200 yards of the main hall.

In the programme given below, the venue of all meetings is the Winter Garden, except where otherwise stated.

Preliminary Programme for 1954 B.E.P.C.

June 14	1.00 p.m.	Eastbourne Rotary Club Luncheon (Drive Hotel).
	8.30 p.m.	Electrical Exhibition: Official Opening.
June 15	10.00 a.m.	Civic Welcome: Presidential Address.
	12.30 p.m.	E.A.W. Luncheon (Grand Hotel).
	2.30 p.m.	"The Market for Electrical Appliances and the Inter-dependence of Home and Export Trade," by Sir George Nelson (B.E.A.M.A.).
	3.00 p.m.	Ladies' Tea (Music Pavilion, The Pier).
	8.00 p.m.	Mayoral Reception.
June 16	10.00 a.m.	"Modern Lighting for Industry, Commerce and the Home," by W. J. Jones (E.L.M.A.). "Electricity in the Modern Home," by Dame Caroline Haslett (E.A.W.).
June 17	10.00 a.m.	"Development of the Domestic Electricity Load at Home and Overseas," by D. Bellamy (Chairman, Y.E.B.).
	2.30 p.m.	"The Comparison of Installation Practice at Home and Overseas," by S. L. M. Barlow (E.C.A.).
	7.30 p.m.	Annual Dinner and Dance (Grand Hotel and Winter Garden).
June 18	10.00 a.m.	Electrical Forum.
	12 noon	Annual General Meeting.

Earthing in Practice

PART I—ELECTRODE INSTALLATION AND ASSOCIATED MEASUREMENTS

By R. W. RYDER, B.E., B.SC., A.M.I.E.E.

ALTHOUGH much has been written in recent years on the subject of earthing it is surprising to see on so many occasions faulty application of this method of providing safety in electrical installations. The fact that many more accidents of a serious nature do not occur can only be interpreted as proof of the very high standard of insulation provided in most metalclad appliances on sale to the consumer public, both industrial and domestic.

There can be no doubt that most of the faulty installations to be found are due mainly to lack of knowledge by those concerned, both in the consulting and contracting branches of the industry, of the fundamental principles involved. It is hoped in this and subsequent articles to review these basic principles and also to demonstrate their practical application in the supply industry as a whole.

By earthing is meant the making of a connection to the general mass of earth by means of an earth electrode. Such electrodes may be readily available, having been primarily installed for some other purpose. The most common type of natural or pre-installed earths is the copper or cast iron pipes laid by water supply authorities. Frequent use is made of these pipes for earthing purposes, especially in domestic premises, but due mainly to the increasing use of concrete or other non-conducting materials in the manufacture of water pipes, the point is now being reached where alternative means of earthing must be given serious consideration.

Where such natural earths are not available, or where it is considered inadvisable to use such earths, special earth electrodes must be installed. The size and type of electrode to be used will be determined by the duty which the electrode is required to perform.

In general, it may be stated that if the resistance to earth of the electrode system is low enough, most of the other characteristics required will be present. As most of this resistance is to be found within the immediate vicinity of the electrode, it is possible to arrive at reasonably accurate results by confining our attention to a quite limited area in the neighbourhood of the electrode under discussion.

TABLE I. FORMULA FOR TYPES OF EARTH ELECTRODES WHICH ARE IN COMMON USE

Type of electrode	Formula
Driven rod L = depth a = radius of rod	$R = \frac{\rho}{2\pi L}\left(\log_e \frac{4L}{a} - 1\right)$
Buried wire 2L = length $\frac{S}{2}$ = depth	$R = \frac{\rho}{4\pi L}\left(\log_e \frac{4L}{a} + \log_e \frac{4L}{S} - 2 + \frac{S}{2L} + \ldots\right)$
Round plate a = radius $\frac{S}{2}$ = depth	$R = \frac{\rho}{8a} + \frac{\rho}{4\pi S}\left(1 + \frac{7}{24}\frac{a^2}{S^2} + \ldots\right)$
Square plate	Same as for round plate with same area.

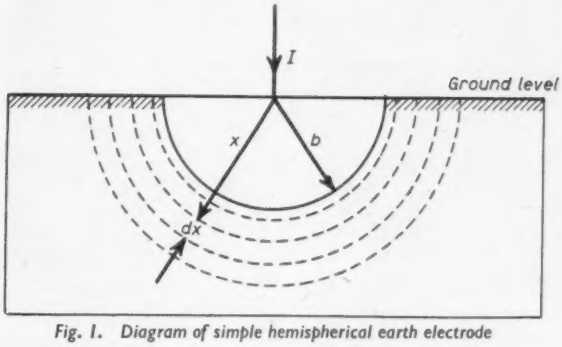


Fig. 1. Diagram of simple hemispherical earth electrode

Electrode Resistance

From a theoretical viewpoint the simplest form of electrode is a hemisphere with its flat surface buried flush with the ground (see Fig. 1). Such electrodes are, of course, never used in practice but some very interesting theoretical data can be obtained by examining its properties.

The resistance of any elemental shell of radius x is given by the simple formula

$$r = \frac{\rho dx}{a} \quad \ldots\ldots(1)$$

where ρ = resistivity of soil.
dx = thickness of shell.
a = surface area of shell.

It will be clearly seen that as the distance x of the elemental shell increases, the surface area ($2\pi x^2$) increases rapidly and as a result the increments of resistance added by shells at some distance from the electrode rapidly reach infinitesimal values.

The total resistance of this electrode to infinity is given by the formula

$$R = \frac{\rho}{2\pi b} \quad \ldots\ldots(2)$$

where b = radius of hemisphere.

There is a direct relationship here between the resistance of the electrode and its electrostatic capacitance. Working on this basis Prof. Dwight has developed formulae for the more common electrodes (see Table I).

It will be seen from the formulae for both the driven rod and buried wire that the diameter of the wire or rod has very little influence on the resistance. As rod electrodes are usually driven by means of a hammer or an electric driver it is desirable to use the smallest diameter rod possible that will give (a) sufficient mechanical strength during

driving and (b) sufficient cross-section to handle the fault currents likely to arise in the installation concerned. Where sectional rods are used, the coupling between the rods should be the same diameter as the rod itself as otherwise the force required to drive them through the soil will increase enormously.

From a practical point of view the driven rod is the most suitable form of electrode for the following reasons:

(1) Practically no excavation is required.
(2) The cost of the rods can be very low compared with other forms of electrodes.
(3) Where the surface soil is sandy or very dry (high resistivity) it is usually possible to drive rods deep enough to enter low resistivity soil thereby obtaining very considerable reduction in resistance.
(4) Seasonal variations are very much less with deep driven rods as such rods will be unaffected by the drying out of the upper strata of the soil in summer or freezing in winter.

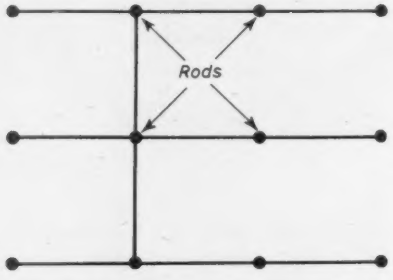


Fig. 2. Formation of earth rods for lowest resistance where available space is limited

(5) The connection between the rod and the conductor can be very simple and can be easily inspected if desired.
(6) If artificial treatment is desired this can be done more readily with rod electrodes.

Multiple Rod Installations

Where the resistance required cannot be obtained with a single driven rod the usual procedure is to drive several rods over as large an area as possible and connect all the rods together by means of a buried wire. Provided the spacing is large and the number of rods small the reduction in resistance approximates to the inverse of the number of rods used. Thus two rods spaced widely apart should give half the resistance of one rod driven to the same depth. The interconnecting wire also helps to maintain this reduction, but where the area over which the electrodes are to be driven is limited a position will be reached rapidly where the reduction to be obtained by driving further rods is small due to the overlapping of the resistance areas of each electrode.

In general the spacing of rods should be at least equal to twice their depth. The best results can be obtained by placing the rods in a straight line, if this is possible. Where the area is confined then the best solution is to place the rods on a square formation as shown in Fig. 2.

This is the usual procedure adopted in substation compounds, and by careful planning of the interconnecting wires all steel towers and other non-current carrying metal can be bonded economically to the earth electrode system.

On l.v. overhead networks it is usually possible to spread the driven rod electrodes over a very large area, and thus the reduction in resistance is a maximum. Where networks are in course of erection, with a little planning it should be possible to drive the rods at the bottom of the pole holes before filling, thus obtaining greater depth and thereby effecting still further reductions in resistance.

Considerable experience has been obtained in Ireland over the last six years with ½ in. diameter galvanised steel rods in 6 ft sections. This type of rod has been used exclusively in both rural and urban areas on h.v. and l.v. earth installations with great success. Where possible 12 ft rods (in two 6 ft sections) have been adopted as standard. Where it is impossible to drive rods to their full depth, several rods are driven at an angle spaced 12 ft apart and connected together by means of bare copper or galvanised steel wire, laid 18 in. below the surface.

Some difficulty has been experienced due to corrosion especially at connecting joints, but this trouble has been eliminated by wrapping the joints with a waterproof impregnated tape which excludes moisture and air.

Installation Design

Although it is possible to design an earth installation from graphs prepared on a theoretical basis the simplest method of deciding the number of rods required to obtain a given resistance is to base all calculations on the results obtained with a single test rod driven on site to the maximum depth possible.

Assuming the spacing between the rods is equal to twice the depth of each individual rod, the number of rods required for any given resistance can be obtained from Fig. 3.

Apart from the size, shape, number and depth of electrodes which has been discussed above, the resistance of and earthing installation is directly proportional to the resis-

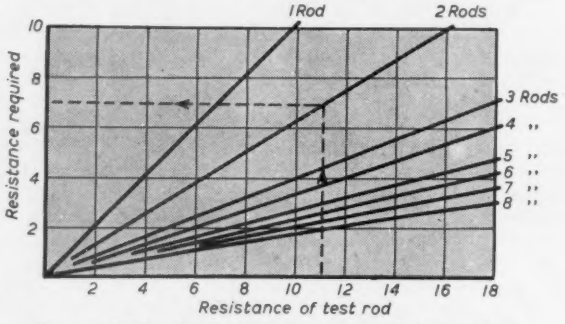


Fig. 3. Number of rods required to give any desired resistance. The curves apply when the spacing between rods is twice the depth of each individual rod. Resistance units are arbitrary

tivity of the soil in the immediate neighbourhood. This is effected by the following factors:

(1) the composition of the soil,
(2) the temperature of the soil,
(3) the moisture content of the soil.

Table II shows the range of resistivities to be expected from soils of different composition at normal temperatures.

Very often a mixture of two or more of the above types of soil will be found. Usually where high-resistivity sandy soil is found, it is possible by deep driving to reach low resistivity clay at lower depths. It is not possible to determine on a theoretical basis the effect of the combination in such cases and it is for this reason that it is suggested that the simplest solution is to drive a test rod on site and base the design of the electrode system on the results obtained with this trial electrode.

Moisture content has a very marked effect on resistivity. Clay which has a resistivity of 6,400 ohms per cubic centimetre with 30% moisture content increases to 53,000 ohms per cubic centimetre when the moisture content is reduced to 10%. Similarly, temperature effects are significant. Sandy loam which has a resistivity of 7,500 ohms per cubic centi-

TABLE II. COMPOSITION OF SOIL AND RESISTIVITY

Soil	Resistivity ohms/cubic cm
Clay	2,000–6,000
Sandy clay	8,000–20,000
Marsh, peat	15,000–30,0000
Sand	25,000–50,000
Rock	Up to 1,000,000

metre at 20° C. increased to 30,000 ohms per cubic centimetre when reduced to freezing temperature.

As the moisture content increases in winter and the temperature falls these two characteristics have an opposing effect on the resistivity. Nevertheless where electrodes are placed near the surface, there is a very considerable increase in resistance during the summer months. This variation can be very much reduced by deeper electrodes, which again points to the advantages of driven rods which are the only practical form of deep electrodes.

Where it is found difficult to obtain low resistance earths as described above, great improvements can be achieved by chemical treatment of the soil in the immediate neighbourhood of whatever electrodes have already been driven.

Common salt is the most usual chemical used for this purpose, its principal advantages being cheapness and availability. Several preparations have also been put on the market for this purpose, but the main disadvantage of this method is that the reduction obtained is only temporary, and the treatment has to be repeated every few years.

Efforts have also been made to reduce the resistance by filling in the space around buried electrodes with coke. The results obtained in this manner are more permanent but can hardly be justified owing to cost.

Measurement of Resistance

Whatever type of electrode is chosen, it is very desirable that tests are made to determine the resistance of the complete installation. The most common method of testing resistance is known as the "two current and one potential" method. This is based on the measurement of the potential drop across the electrode under test by the passage of current through it to an auxiliary electrode placed some distance away. The potential drop is measured between the electrode under test and a second auxiliary electrode placed half way between the other two electrodes.

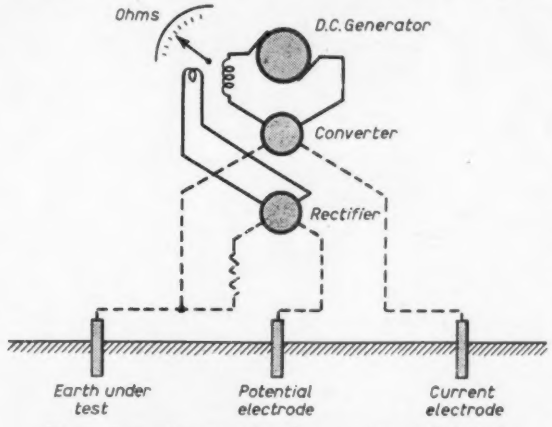


Fig. 4. Instrument connections for measurement of electrode resistance by "two current and one potential" method

Fig. 4 shows the best known instrument used for this purpose. It is the Evershed and Vignoles "Megger" Earth Tester which is available to measure various ranges of resistance.

This instrument incorporates a hand driven d.c. generator which is mechanically coupled to simple convertor and rectifier rings. The direct current generated by turning the instrument handle is converted to a.c. before passing through the soil via the electrodes and is rectified on its return before passing through the current coil of the test instrument. The a.c. voltage across the electrode under test is also rectified before being applied to the voltage coil of the instrument the dial of which is calibrated directly in ohms.

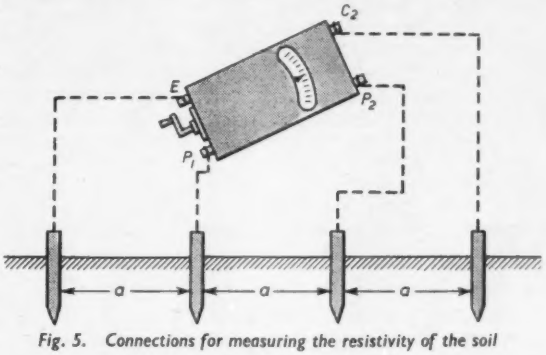


Fig. 5. Connections for measuring the resistivity of the soil

The principal advantages of this type of instrument are, firstly, that any stray a.c. effects present in the electrode system under test can be eliminated by increasing the speed of the turning handle, as the frequency of the test a.c. current depends on the speed of rotation of the generator shaft. Secondly, with d.c. test current polarisation is liable to occur which tends to give a false reading. By using this instrument any errors of this type are eliminated.

It should be remembered that certain values of resistance of the auxiliary electrodes have been assumed in calibrating the test instrument. Errors of up to 30% are liable to arise due to any abnormally high resistance in auxiliary electrodes. Fairly high values are assumed, however, and it is unlikely that such errors will in fact occur, provided reasonable care is taken in driving the auxiliary electrodes.

It is important however to ensure that the potential auxiliary electrode is placed as near as possible midway between the earth under the test and the current auxiliary electrode, and the distance between these two latter should be at least eight times the greatest horizontal dimension of the installation under test.

Where the electrode system is extensive it may not be possible to achieve this required spacing. In such cases especially for substation earthing installations, where it is usually necessary to carry out yearly tests, it is recommended that the same positions be used for the auxiliary electrodes on each occasion, so that the results obtained each year will be comparable. The simplest method of achieving this, especially if it is not possible to leave permanent pegs or other marks in the ground, is to prepare a sketch of the established positions of the auxiliary electrodes which can be referred to by the electrician making the measurements each year.

Measurement of Resistivity

A modified form of the "Megger" Earth Tester can be used to measure the resistivity of soil. Four test electrodes are required for this purpose spaced as shown in Fig. 5.

E and C_2 are connected to the current circuit of the instrument while the voltage coil is connected across the two test electrodes P_1 and P_2.

The resistivity of the soil can then be determined by using the formula

$$\rho = 2 \pi a R$$

where ρ = resistivity in ohms/cu cm.
a = spacing of test electrodes in cm.
R = reading of test instrument.

The figure for resistivity thus obtained is the average resistivity to a depth equal to the spacing of the test electrodes. By spacing these further apart for a number of tests it is possible to ascertain within certain limits, the resistivity of successive strata of soil at various depths. This method has been adopted for carrying out preliminary geological surveys with quite good results.

No matter what type of electrode is used it is essential that it should throughout its lifetime fulfil the functions for which it was installed. Normally the operation of the electrical apparatus associated with the earthing installation is in no way dependent on the earth resistance and therefore any defects which may arise will not be discovered until a fault occurs and the earth protection fails to operate. Hence it is essential that the greatest care is taken to ensure that the earthing installation is properly installed at the outset and that during its lifetime periodic tests are made to ensure that it will continue to be in a fit condition to fulfil its purpose should the occasion arise.

In another article it is hoped to deal with some aspects of the application of earthing in the electrical supply industry.

Certain illustrations and information used in this article have been taken from the author's book on the subject "Earthing Principles and Practice," which is published by Sir Isaac Pitman & Sons.

B.E.A. Plant Installed in 1953

A DECREASE in the annual amount of new plant installed by the B.E.A. is reported for 1953 when a total additional output capacity of 1,413 MW was commissioned. Previous figures were 1,539 MW in 1952 and 1,113 MW in 1951. Although this may at first sight appear disappointing, it must be remembered that the Authority planned for a plant installation figure of between 1,300 and 1,500 MW, so that the actual result, just above the mean of these figures, lies within the estimate.

The additional plant consists of 31 turbo-alternators and 68 boilers with an aggregate evaporative capacity of 19,725 klb/hr and this was installed in 34 of the Authority's power stations. Eight of the stations, which are indicated by asterisks in the table, are new stations, in which plant has been installed for the first time this year.

To meet the winter peak demand, the aim each year has been to attain the maximum by 31st December, and this year, due to strenuous efforts on the part of the Authority's constructional staff, building contractors and manufacturers, some plant has been installed in advance of the scheduled date of completion.

In view of the comments made by the Beaver Committee on Economy in the Construction of Power Stations, it is worthy of note that 20 of the 31 new sets are 50 MW rating or greater. The table below gives details of the turbo-alternators and boilers installed.

PLANT COMMISSIONED IN B.E.A. POWER STATIONS DURING 1953

Station	Division	Turbo-Alternators			Boilers			Main H.P. Pipework Maker
		No.	Rating MW	Maker	No.	Rating klb/hr	Maker	
Bankside	London	1	60	B.T.H.	2	375	Foster-Wheeler	Parsons
Barking C	London	1	75	B.T.H.	3	405	Babcock & Wilcox	Aiton
Battersea 'B'	London	1	100	M.V.	1	425	Babcock & Wilcox	Aiton
Bold A*	M.N.W.	1	30	M.V.	1	300	Yarrow	Aiton
Braehead	S.W. Scot.	1	50	Parsons	1	300	Babcock & Wilcox	Babcock & Wilcox
Brighton B	S. Eastern	2	52	R.W.	3	320	Babcock & Wilcox	Parsons
Bromborough	M.N.W.	—	—	—	2	300	Babcock & Wilcox	Stewarts & Lloyds
Brunswick Wharf	London	1	52·5	M.V.	2	320	Clarke Chapman	Parsons
Carmarthen Bay*	S. Wales	2	52·5	M.V.	5	240	Babcock & Wilcox	Stewarts & Lloyds
Carrington*	N. Western	1	60	M.V.	3	360	Babcock & Wilcox	Stewarts & Lloyds
Chadderton*	N. Western	1	60	M.V.	1	360	Simon Carves	Stewarts & Lloyds
Clarence Dock	M.N.W.	1	51·5	M.V.	—	—	—	Stewarts & Lloyds
Connah's Quay*	M.N.W.	1	30	Parsons	1	300	International Combustion	John Thompson
Croydon B	S. Eastern	—	—	—	1	320	Simon Carves	Aiton
Deptford East	London	1	52·5	M.V.	2	250	Foster-Wheeler	John Thompson
Doncaster*	Yorks	1	30	G.E.C.	3	180	Mitchell	Aiton
East Yelland*	S. Western	2	30	Parsons	4	180	John Thompson	Parsons
Huddersfield	Yorks	1	30	G.E.C.	1	180	Bennis	Parsons
Huncoat	N. Western	—	—	—	1	305	Simon Carves	Parsons
Keadby	Yorks	1	60	Parsons	1	550	Stirling	Parsons
Littlebrook C	S. Eastern	2	60	Parsons	3	360	International Combustion	Parsons
Nechells B	Midlands	1	52·5	Parsons	4	230	International Combustion	Stewarts & Lloyds
North Tees C	N. Eastern	1	60	Parsons	3	360	Babcock & Wilcox	Babcock & Wilcox
Poole	Southern	—	—	—	2	300	International Combustion	Aiton
Roosecote*	N. Western	2	30	M.V.	2	300	Yarrow	Aiton
Rotherham	Yorks	—	—	—	1	200	International Combustion	Stewarts & Lloyds
Rye House	Eastern	2	32	RW/Parsons	2	350	Babcock & Wilcox	Stewarts & Lloyds
Skelton Grange	Yorks	—	—	—	1	360	International Combustion	Aiton
Staythorpe	E. Mid.	1	60	B.T.H.	2	240	Babcock & Wilcox	Aiton
Thornhill	Yorks	—	—	—	2	180	Mitchell	Stewarts & Lloyds
Uskmouth	S. Wales	1	60	G.E.C.	3	360	Babcock & Wilcox	Aiton
Walsall	Midlands	—	—	—	3	180	Babcock & Wilcox	Aiton
West Ham	London	—	—	—	1	180	John Thompson	Aiton
Westwood	N. Western	1	30	B.T.H.	1	300	Babcock & Wilcox	Stewarts & Lloyds

* New station during 1953.

around the trade

by Peregrin

LET it be understood at the outset that the ELECTRICAL TIMES has not been enlarged merely to make room for me. Nor, it is hoped, will it be necessary to revert to pocket size when it is deemed expedient to get rid of me. My appearance here happens to coincide with the welcome return to normal size, and it is due in part to the happy result of a misunderstanding. When the editor had the idea that someone should interest himself and comment on matters concerning the Trade, I eagerly volunteered, for to me "The Trade" has always denoted the enviable calling of licensed victualler, and I contemplated with relish a carefree future of agreeable and convivial excursions. By the time I had realised that the more sober Electrical Trade was to be my subject, this page had been committed to my care, so here I am.

Indeed, I have long shared the editor's view that the ideas and activities of those of us engaged in the various sections of electrical trading, are worthy of more notice than they usually attract. Even so I embark on this feature, which is to appear once in every four weeks, with the uneasy feeling of rushing in where a more celestial scribe would fear to tread. For my terms of reference are alarmingly wide. I am free to comment on anything considered to be of interest to my trade readers, be they manufacturers, wholesalers or contractors. That is quite a task to be going on with.

I do not expect all who read my views to agree with them. Rather do I hope to stimulate, from time to time, a little of that friendly argument that is so much better than mere indifference.

Recorded Evidence

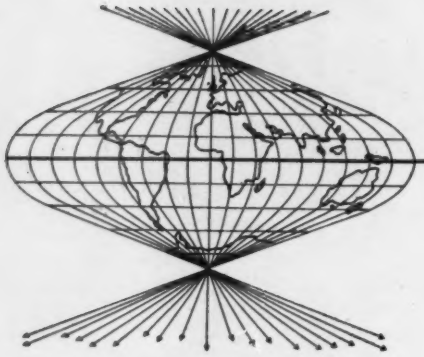
An electrical contractor ended the old year by making legal history, being successful in having a tape recording admitted as evidence. Recordings have been produced in Court on other occasions, but this is believed to be the first time one has been accepted in support of a prosecution. It happened at Walsall. An employee was charged with theft, and the tell-tale tape proved that he had been acquainted, on his engagement, with the rules and methods of his new employers. A conviction resulted, though the defence took exception to a witness that could not be cross-examined. This opens up endless possibilities. A contractor might be tempted to take a machine along when he has to meet the architect, or the customer, at a job in progress. The subsequent play-back might help to confirm who ordered the various extras and alterations and who agreed to pay for them. It could even show, at the inevitable inquest on completion of a job, whose fault it was that there was no light in the garage, and why the only plug in the lounge was placed behind the piano. Not so long ago this marvel of science could have been a menace to trade representatives. Some of them would have blushed, if they can blush, to hear their promise of "Three weeks delivery" recited to them after three months' delay. But those days have almost gone, thank goodness, and 1954 should see the end of jokes about electrical contractors storing their conduit and switchplugs in the safe at night, instead of the cash.

Being incapable of separating business and pleasure I had the ELECTRICAL TIMES in my pocket when I went visiting, so Boxing Day found me discussing with a manufacturer friend the excellent article by Mr H. W. Swann. My friend acknowledged the literary merit and the interest of the contents, but rather grudgingly, because he says he has a permanent grouse against factory inspectors. He declares that when a new building is planned, or an extension or a major re-arrangement of plant, the inspector keeps out of sight until all is completed and running smoothly and then comes along and disapproves of everything, with consequent delay and expense. His contention is that the authorities should first state their requirements, so that they can be embodied in the general scheme, instead of criticising when the job is finished. He claims to have had bitter experience of this kind of thing.

Anxious to Help

Well, my friend must have been unfortunate in his dealings with factory inspectors. I have since discussed this with an electrical factory inspector and he confirmed what I have long held, that his department is always glad, indeed anxious, to co-operate with factory owners and advise them, either before or during any such project. But my inspector friend made two almost obvious reservations. One is that he cannot be expected to act as a consultant. He is able and willing to express his requirements with respect to a complete scheme or project, but he cannot set the seal of official approval merely on the strength of sketchy and speculative details. The other reservation is that the inspector does not accept the responsibility of taking the initiative in such cases. His job is to take things as he finds them, not try to foresee conditions as they may be in the future. It can be imagined that if a factory inspector happened to be passing a building or extension and he dropped in to indicate what precautionary measures he would expect to be adopted, he would get a cool reception from the owner.

A most seasonable topic is being debated in the electrical trade just now. One that has been almost dormant since the ELECTRICAL TIMES slimmed itself overnight in 1941. I refer to the revival of trade Christmas gifts. Bribes, gratuities, goodwill offerings, symbols of atonement for the past or hope for the future, sops to Cerberus, or just acts of friendship, according to one's point of view or conscience. I find a strong feeling that it is unnecessary, unethical and expensive, and that it is a pity to start it all over again. It seems to be agreed, by the givers and the receivers, that a diary is a useful and quite adequate reminder of past services. One harassed wholesaler declared he would much prefer an improvement in service to a bottle of expiatory whisky, and I think most will agree that the manufacturer, wholesaler and contractor who does his job well all though the year has no need to paint the lily at Christmas. I hasten to add that these views are not necessarily my own. I am broadminded enough not to be unduly scandalised should a box of cigars arrive for me, and it is not too late I hope.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Registering Ontario Wiremen

The Ontario Electrical Contractors Association is to inaugurate a registration system for its own membership, it was decided at last month's meeting. The president of the organisation, Mr G. Risedale, has announced that it had been decided there should be some form of control over electrical contractors. Toronto and at least 15 areas surrounding it, he said, required that electricians must have licences and, in order to work in all the municipalities, 16 tickets were required. Members of the association would have to pass rigid examinations as to their ability, quality of their work and sincerity and would be graded according to qualifications. The association would bond each member who qualified, he added.

Anti-dumping

New Canadian Customs' regulations to prohibit unfair dumping of U.S. manufactured goods should be applied to electrical goods and household appliances as well as to American textiles, declared Mr D. M. Fleming, a Toronto M.P., in Parliament recently. He was speaking during debate on a Government Bill to tighten laws governing dumping of foreign goods in Canada. The Minister for Revenue, Mr. McCann, when introducing the Bill explained that the new regulations could be applied to any industry, not only textiles. But instructions had gone out to customs officials concerning textiles because of the plight of that industry in recent months.

Appliance Firms in Struggle

Survival of many firms in the Canadian electrical appliance industry will be extremely difficult in 1954, Mr F. M. McGovern, president of Thor-Canadian Co. has warned. He listed over-production as the first of two important factors which led him to that conclusion. Over-production had caught up with firms in Canada, and because a similar situation was apparent six months ago in the United States, the Canadian concerns were now facing severe competition from that quarter. The second factor affecting the Industry was the serious dislocation among retailers since price list maintenance had been removed. In his view that problem worsened each month. While the industry might still suggest a list price for appliances and recommend good servicing, many dealers thought in terms of a quick turnover and would on occasion sell goods at a small fraction of their normal mark-up or profit. That unsettled public confidence. If the small dealer, who may be handling these brands, was to compete, it means he might soon find he was operating his whole business at a loss, he added.

U.S.A.

Objection to St. Lawrence Scheme

The right of the Federal Power Commission to licence the New York State Power Authority to co-operate with the Hydro Electric Power Commission of Ontario in the St. Lawrence River power project, was attacked in the U.S. Court of Appeals in Washington a few days ago. Lawyers indicated that the fight would be taken to the Supreme Court, regardless of which side won in the Court of Appeals. Opponents of the scheme alleged that the Federal Power Act did not authorise the Commission to licence such a project and that participation by New York State in an international project of this nature was a violation of the compact clause of the Federal Constitution.

S. AMERICA

Nationalisation for Brazil?

A threat of possible nationalisation of the electricity supply industry in Brazil, was made by President Vargas recently. He alleged that the country's progress was being slowed by the scarcity and high cost of power; there was urgent need to exploit the vast potential of Brazil's hydro-electric power. He revealed that his Administration is now taking steps to establish a new power company with the title "Electrobraz," which would provide capital for the construction of power plants in states and municipalities. It would be constituted along the lines of Petrolbraz, which was recently created for the exploitation of Brazil's oil resources. In this matter obstacles had been raised by interests of private companies he alleged, whose investments in foreign currencies have increased a hundred-fold in cruzeiros since they started activities in Brazil. The country would have to provide the necessary funds to give a solid base to the national power industry or otherwise it would be necessary to take over foreign enterprises which are not giving the desired results, he added.

Over 50% of electric power production in Brazil is controlled by the Brazilian Traction Light & Power Co., which is a Canadian concern. At the end of 1952 the installed capacity of that company's generating plant totalled 958,309 kW. During 1953, the first two 35 MW sets were put into operation at the Forcacava hydro-electric station, which is to have an ultimate capacity of 330 MW. In the present year the first 80 MW set will be put into service at the steam generating station under construction on the outskirts of São Paulo. A further 86 MW unit will follow later. The company also has under construction the Cubatao hydro-electric station which is to serve the São Paulo system. Here the first two of four 65 MW sets are scheduled for operation in 1955.

EUROPE

National Two-part Tariff for Belgium

A national, but optional, two-part tariff is being introduced in Belgium after consultation between the electricity producers and the government. Two versions are available, depending on the use to which the power is to be put. For such things as lighting, washing machines, radio, etc., it will be advantageous to accept the "little use" tariff which has a running charge of 2 francs/unit. Other heavy users, with electric cookers, will find it preferable to adopt the "heavy user" tariff with a unit charge of 1 fr 45 (1 fr 65 in some cases). The fixed charge is calculated on the basis of the number of "blocks" constituting the user's house. By a "block" is meant, whether wired or not, an area in which living can be carried out and which has a surface area less or equal to 25 sq metres. Cellars, staircases, corridors, etc., are counted as one block. The fixed charge is increased

by one "half-block" for each additional 15 sq metres or fraction of that area, electrified or not, by which the surface exceeds the basic 25 sq metres. For the purpose of calculation a base factor, corresponding to 4 blocks, which implies about 3 living rooms together with the corridors, staircases, etc., has been taken, and premises with accommodation less than this are excluded from the tariff which for this minimum condition works out at 250 francs/annum. Successive areas of 15 sq metres require an additional 40 francs. The prices are, however, locked to the cost of living index as established by the Ministry of Economics, and the present values are about 10% greater than those given above. Power placed at the disposition of the user is 1 kW base plus 250 W per block or 1·5 kW base plus 250 W per block, depending on whether the user has decided to accept the small or large consumer tariff. The agreements will be normally on a yearly basis. Operative date for the tariff has not yet been fixed. It is anticipated that the majority of domestic consumers will take advantage of this new tariff, as the present prices are somewhat higher, it is stated.

AFRICA

New Station for Mombasa

Plans for the construction of a new steam power station in or near Mombasa, have been announced by the East African Power & Lighting Co. Cost of the station may be about £1 million, but the first stage will probably cost £300,000. Officials of the company are now investigating likely sites. The new station has become necessary to cope with Mombasa's rapid industrial expansion in recent years. The East African Power & Lighting Co. already operates a diesel generating station there, and additional power is taken from the Pangani Falls hydro-electric station of the Tanganyika Electric Supply Co., a subsidiary company.

INDIA

Scheme Examination

A high level Technical Committee has been appointed by the Planning Commission of India to give a final opinion on the power aspect of the Bhakra-Nangal project. This was decided upon as there were differences of opinion between the design engineers of the project and the engineers of the Punjab Government on one side and the Central Water and Power Commission on the other, Mr J. L. Hathi, Deputy Minister of Planning and Irrigation and Power, stated recently. The Committee consists of Mr N. N. Iyengar, of Tatas, as chairman, and Dr K. P. P. Menon, member C.W.P.C. (Power Wing), and Mr S. S. Kumar, chief electrical engineer and secretary, Punjab Government, P.W.D. (Electricity Branch), as members. The Committee is expected to complete its examination in a month or two and then submit its findings.

AUSTRALIA

Tenders for Snowy Plant

Several firms in Britain are keenly interested in the results of tenders for the supply of four 80 MW generators and their associated Francis turbines for the T.I. power station of the Snowy Mountains Hydro Electric Authority. The closing date for the receipt of tenders was 24 Feb. last, and it should not be very long before an announcement of the contract will be made. It was reported last week that a Japanese engineering concern had submitted a highly competitive tender for the plant. This may be the Tokyo-Shibaura Electric Co., which announced last May that it had submitted a tender for the four 80 MW generators and turbines. In view of the latest report, it is stated that Australian Ministers consider there would be widespread public resentment of acceptance of any Japanese tender, but it would help to adjust Japan's adverse balance of trade with Australia.

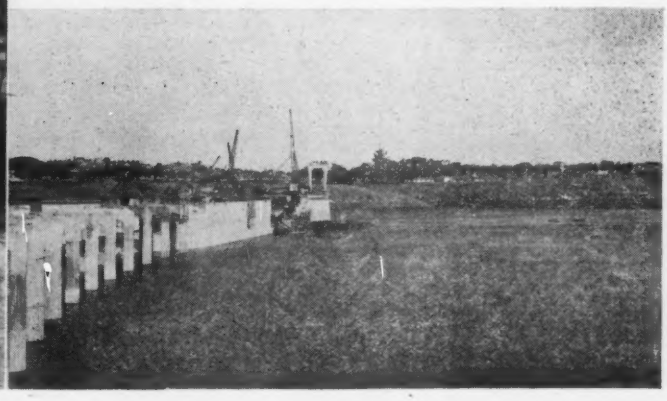
Power from Snowy

In view of the fact that the first supply of electricity is expected from the Snowy Mountains Hydro Electric Scheme during the current year, the New South Wales Electricity Commission is pushing ahead with its plans for its intake for Sydney. A main metropolitan substation is to be erected at Revesby, the Cumberland County Council having agreed to the site, involving an alteration in the Council's planning scheme. The transmission line from the Guthega generating station will take the power from Dapto, through the Sutherland area.

NEW ZEALAND

Progress at Christchurch

In its fiftieth year of operations, ended 31 March, 1953, the Christchurch Municipal Electricity Department made a surplus of £7,493. Although small, this may be considered quite satisfactory in view of the restrictions which had to be imposed during the winter owing to the drought. These restrictions resulted in a heavy loss to the department, and units sold, at 263·4 millions, were only 4·3% more than in the previous year. Of that total, 184·5 millions were for domestic use, providing an average revenue of 0·557d. p.u. The year under review saw a net increase of 1,479 in the number of consumers. A bright feature of the Department's operations was the 45% increase in turnover of the showroom. Altogether, 148 cookers, 68 refrigerators and 233 washing machines were sold. The report adds that the increase in the sale of washing machines is some indication of the demand which would develop for those appliances if ample supplies were available. As to the future, Mr J. C. Forsyth, engineer-manager, is optimistic that the completion of the Waitaki power station extensions, and construction of the Roxburgh hydro-electric project will bring a great alleviation of power shortage troubles.



OWEN FALLS. The first 15 MW set at this hydro-electric scheme of the Uganda Electricity Board has been started. Left is a view of the sluice discharge from the west bank downstream and right, from the headrace looking east. The water was raised to within 20 ft of the ultimate height to set the first machine running. Its operation means a saving of £1,000 a day in fuel to the Board. The project is to be officially opened by H.M. the Queen in April.

Personalities

IN THE INDUSTRY

Now with the Midlands Electricity Board at Worcester, **Mr A. D. Batten,** GRAD.I.E.E., has accepted an appointment with the Trinidad and Tobago Electricity Commission as assistant area engineer—south. He leaves for Trinidad by air about 17 Jan. Mr Batten gained technical education at the Borough Polytechnic, and subsequently served with the Eastern Electricity Board at Suffolk and Norwich.

Mr P. C. Cooper-Parry, O.B.E., M.C., J.P., F.C.A., has resigned from the board of Johnson and Phillips Ltd., for health reasons.

Mr W. Sweetman has been appointed area manager for the North of England for Parnall (Yate) Ltd.

Mr. W. Sweetman

Mr. C. Bush

Mr. G. Redfern

For seven years London representative of Amalgamated Wireless (Australasia) Ltd.—an associate of Marconi companies—**Mr William Nash** was recently presented by his Marconi colleagues with a silver cigarette box prior to his return to Australia.

The Minister of Fuel and Power has appointed **Col T. F. Hood,** O.B.E., T.D., D.L., F.C.A., as a part-time member of the South Western Electricity Board. The Minister has also re-appointed **Sir Cecil Oakes,** C.B.E., J.P., D.L., as a part-time member of the Eastern Electricity Board. But the latter Board has now lost two of its original members—**Capt J. M. Donaldson,** M.C., M.INST.C.E., M.I.E.E., and **Mr W. J. Humphreys,** who both retired from that office at the end of December last. The Board has placed on record their warm appreciation of the distinguished services which those two gentlemen have rendered to the Electricity Supply Industry. Capt Donaldson was, of course, for many years associated with the Northmet Power Co., retiring from the position of general manager at the end of October, 1943, but he continued as a director of the company, and was coaxed out of retirement to become a part-time member of the Eastern Board in 1948. Mr Humphreys, prior to vesting day, had many years service at Barking power station, and had been associated with the Whitley Council machinery for the Industry since its inception shortly after the first World War.

Mr L. A. Buckley, of 315 Lichfield Rd, Four Oaks, Sutton Coldfield, Birmingham (telephone Four Oaks 30) has been appointed Midlands sales representative for Reliance Electrical Wire Co., Ltd.

The National Coal Board have appointed **Mr L. H. Daniel,** M.SC.(ENG.), M.I.E.E., as director of their new Central Engineering Establishment to be set up at Bretby, Derbyshire. Since 1949 he has been deputy chief engineer of the Ministry of Supply's Fighting Vehicles Research and Development Establishment. Educated at Woolwich Polytechnic Secondary School, he graduated at Queen Mary College in 1928, and was a student apprentice with the British Thomson-Houston Co., Ltd., until 1931 when he joined the laboratory staff of the British Electrical and Allied Industries Research Association. From 1939 he worked for that Association on Government contracts until joining the Ministry of Supply in 1946 as senior principal scientific officer.

The Marconi International Marine Communication Co., Ltd. has appointed **Mr J. W. Dalton** as manager of its Grimsby depot. Until October last he was the company's depot manager at Cape Town, a position which is now filled by **Mr K. Blinkhorn-Street.**

Sir Harry Brown, C.M.G., M.B.E., M.I.E.E., who in 1940 joined the British General Electric Co. Pty. Ltd. of Australia as chairman and joint managing director and later held the position of full-time chairman, has resigned, at the age of 75. His resignation took effect at the end of December. **Mr T. E. Morgan,** formerly managing director of the British General Electric Co. Pty. Ltd. has been appointed chairman and managing director of the Australian company. At the same time **Mr A. T. Bridge, Mr R. J. Darton** and **Mr C. Drabble** have been appointed directors. Sir Harry Brown, who was educated at Bede College, Sunderland, and Durham College, Newcastle-on-Tyne, has had a distinguished career. During the first World War he was responsible for the telephone plant of the United Kingdom and emergency communications for defence systems. He went to Australia in 1923 as technical adviser to the Commonwealth Government in connection with Post Office matters and was afterwards appointed Director-General of Posts and Telegraphs for the Commonwealth. He has frequently represented Australia abroad at radio and telegraph conferences.

Newman Industries Ltd. announce the appointment of two additional directors to the board, with effect from 1 Jan. They are **Mr Charles Bush,** F.C.I.S., who has been the company secretary since September, 1950 (he will retain that office), and **Mr George Redfern,** M.A. (CANTAB.), A.M.I.E.E., A.M.AMER.I.E.E., who has been chief engineer to the company for the past 3½ years (he also continues in that position). Mr Redfern has had a wide experience of electric motor manufuture: he was previously with Hopkinson Electric Co., Ltd., also as chief engineer, and earlier with the British Thomson-Houston Co., Ltd. Rugby for thirteen years.

Mr S. C. T. Cox, A.M.I.E.E., has now taken up his duties as a transformer sales engineer on behalf of Gresham Transformers Ltd.

The Mond Nickel Fellowships Committee announces the following awards for 1953: to **Mr J. E. Benson,** of Metropolitan-Vickers Electrical Co., Ltd., Manchester, who is to study the technique and interpretation of results of non-destructive testing of metal components; to **Mr K. Blackburn,** of Dorman, Long and Co., Ltd., who will study hot-metal basic open-hearth practice; and to **Mr N. B. Pratt,** of Broken Hill Proprietary Co., Ltd., Newcastle, N.S.W., who is to study the technical and economic aspects of recent advances in the erection and operation of integrated iron and steelworks in this country and abroad.

Due to retire at the end of March next is **Mr G. D. Clegg,** A.M.I.E.E., who, since September 1950, has been power station superintendent at Nechells "A" and "B" power stations, Midlands Division, B.E.A. Earlier he had been deputy station superintendent there for some time, having originally joined the Birmingham Corporation undertaking as a junior engineer. Later he successively held the posts of shift charge engineer, system control engineer, and boilerhouse superintendent. Mr Clegg gained his technical education at Rochdale and Burnley Technical Schools, Manchester School of Technology and Birmingham Central Technical College. He later served with the Heywood, Newport (Mon.), Burnley, Stockton and Kilmarnock electricity undertakings. He has been a member of the District Joint Advisory Council since its inception, and is chairman of No. 9 Birmingham Generation Group local advisory committee.

To commemorate twenty-five years' service with E. K. Cole Ltd., **Mr L. C. Angus,** production superintendent at the company's Egen works, and **Mr. W. J. Summers,** a machine shop setter, were each presented with a gold watch by **Mr E. K. Cole,** chairman and managing director.

Mr W. Marten Furniss, who has been associated with the Electric Construction Co., Ltd., for more than half a century, has resigned his directorship of the company as from 31 Dec. last, at the age of 83. Mr. Furniss joined the company as sales engineer in 1902. He became general manager in 1915, director and manager in 1926, managing director in 1942, combining the latter office with that of the chairman of the board of the company in 1948. His fiftieth year with the firm was marked last year with a presentation of an illuminated double-dial clock which was installed above the main office entrance.

Recently appointed general manager of Edwin Danks and Co. (Oldbury) Ltd., **Mr L. W. H. Rea,** B.SC.(ENG.), has now been elected to the board of directors following the resignation of **Capt (E.) Gregson,** R.N.R. In addition, **Mr. W. Smith,** works manager, becomes a director in place of **Mr J. W. Hargreaves** who has also resigned.

Two new appointments have been made by the London Electricity Board. For the position of chief engineer, **Mr L. H. Welch,** B.SC.(ENG.), M.I.E.E., has been chosen, while for the new post of personnel officer **Mr H. S. Smith** has been appointed. Mr Welch became manager of the Board's Northern Sub-area on the reorganisation carried out early last year. Previous to that he had been manager of the Board's Western Sub-area since 1948. His early experience was gained with the British Thomson-Houston Co., Ltd., serving as assistant construction engineer for London, Eastern Counties and Southern England. He joined the London Power Co. in 1927 as distributing stations engineer, but in 1936 was appointed distribution engineer to Central London Electricity Ltd., with which concern he was assistant chief engineer from 1944 to 1948. Mr H. S. Smith, who takes up his new duties on 1 Feb., is now the London district labour relations officer of the B.E.A. Prior to vesting day he was assistant general secretary of the Electrical Power Engineers' Association, having been assistant secretary of the Southern region of the Association from 1935 to 1946.

Mr G. D. Clegg

Mr L. H. Welch

Miss M. E. Smith

Bruce Peebles and Co., Ltd., announce two appointments with effect from 1 Jan., 1954. **Mr G. Henderson,** Assoc. H-W College, A.M.I.E.E., at present London manager and chief branch office manager (home), has been appointed general sales manager of the company with the title of sales manager, and responsibility to the general manager. The second appointment concerns **Mr N. L. Jones,** formerly assistant chief branch office manager (home), who has become London manager in succession to Mr Henderson. The latter's long association with the company is well known and he brings with him to his new position a wide experience on the design and manufacturing sides in addition to many years of sales executive experience. Operating from the company's London office, at present 4 Carlos Place, W.1, and early in the New Year, when the address will be changed, at 54 Victoria St, S.W.1, Mr Henderson will be responsible for the co-ordination of all aspects of the company's sales organisation at home and overseas. Mr Jones has also gained wide experience in the heavy electrical plant business. For many years he held a responsible position in the Rotating Plant Sales Department at the head office of the company in Edinburgh. He was appointed to the London office in 1950.

For many years the sole partner in the firm of McLellan and Partners, consulting engineers, **Mr Arnold H. Human,** C.B.E, retired at the end of December last. As from 1 Jan., 1954, the practice is being carried on in the same manner by **Sir Henry Clay,** Bt., **Mr G. N. Hewett** and **Mr T. B. Rolls,** who, together with the partners of Merz and McLellan, will be the new partners. Sir Henry Clay, Mr G. N. Hewett and Mr T. B. Rolls have hitherto served with the firm in the capacity of technical directors. Mr. Human will continue his association with the firm as consultant.

We offer our congratulations to **Miss M. E. Smith,** who is a trainee demonstrator in the Chelmsford District of the Eastern Electricity Board. Having taken her City and Guilds Examination for Plain Cookery in competition with 1,611 other candidates throughout Great Britain, she has now been advised that, in addition to obtaining a First Class Pass, she has been awarded the Silver Medal for gaining the top marks. She also gains the award of a 5 guinea prize from the Worshipful Company of Cooks. Miss Smith took the whole of her training at the Mid-Essex Technical College.

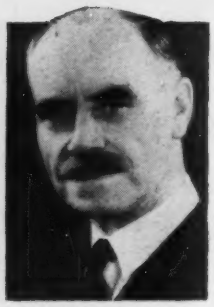
Mr L. W. H. Rea

Mr W. Smith

Mr G. Henderson

Mr N. L. Jones

Mr F. Waine



Mr H. E. Helwig

Four chairmanships for 1954 are announced by the C.M.A. **Mr F. Waine, J.P.,** a director of British Insulated Callender's Cables Ltd., is chairman of the Cable Makers Association for the second year in succession; **Mr H. E. Helwig,** of Siemens Brothers and Co., Ltd., is chairman of the Mains Cable Manufacturers Association and the Mains Cable Manufacturers Association (Super Tension). **Mr F. E. Everard, O.B.E.,** of Pirelli-General Cable Works becomes chairman of the Rubber and Thermoplastic Cable Manufacturers Association, and **Mr B. E. Hedley,** of Standard Telephones and Cables Ltd., is the new chairman of the Overseas Rubber Cable Manufacturers Association.

Mr I. M. Lyon, general manager of the Renfrew and Dumbarton works of Babcock and Wilcox Ltd., recently received presentation from the workers and staff at Renfrew on his retirement.

Mr Lyon joined the firm in Renfrew in 1920 as a draughtsman and six years later assumed control of the general section of the engineering department. He was appointed works manager of Renfrew in 1946 and in 1947 became assistant general manager of Renfrew and Dumbarton, being appointed general manager in 1949.

Mr Alfred Agar, chairman of Davidson and Co., Ltd., for the past thirty-two years, retired at the end of 1953.

Mr B. Raynor has resigned his position with John Trapp (Electrical) Ltd. we learn, and is now acting as technical representative for British Klockner Switchgear Ltd.

Mr W. N. Payne, who has been with Bill Switchgear Ltd., since Jan. 1939, has been appointed area representative for the company for the South Eastern Counties and East Anglia.

His many friends in the Industry will be interested to hear that **Sir John Hacking,** M.I.E.E., who retired last month from the position of deputy chairman (operations) of the British Electricity Authority, has accepted an appointment as consultant with Merz and McLellan the consulting engineers.

At present district commercial engineer at Sutton Coldfield with the Midlands Electricity Board, **Mr L. J. Hawkley,** A.M.I.E.E., has been appointed sales and contracts engineer with the Jersey Electricity Co., Ltd. He takes up his new duties on 18 Jan., we understand.

The London Division of the B.E.A. has appointed **Mr W. Willcox,** A.M.INST.C.E., A.M.I.STRUCT.E., as civil engineer in the department of the chief generation engineer (construction). He was previously a senior assistant engineer (civil) in that department.

General manager of the Morgan Crucible Co., Ltd., **Mr C. J. Hews,** has been appointed to the board of directors.

Works manager of Hugh J. Scott and Co., Ltd., Belfast, **Mr J. C. Breakey,** ASSOC.I.E.E., M.I.P.E., recently received a presentation from the staff and employees on his departure from the firm to take up the position of manager of Fraser and Borthwick Ltd., electrical engineers, also of Belfast. **Mr C. Arkell,** manager of the Electrical Department of Hugh J. Scott Ltd., made the presentation, which was a set of golf clubs.

Mr N. M. Niven is to act as joint managing director of Drysdale and Co., Ltd., with the present managing director, **Mr John Young.**

Mr S. L. Pleasance and **Mr H. Thompson** have been appointed directors of Parnall (Yate) Ltd. Both have been executives of the company for many years.

Mr W. H. Tait, technical director of the Glacier Metal Co., Ltd., has retired, at his own request, from the company's board. He continues to serve the company in the technical field.

Mr Clive Barwell, F.I.A.M.A., publicity manager of Mullard Ltd., has recently been elected chairman of the Incorporated Advertising Managers' Association.

This week, **Mr C. J. Cobbold** has taken up his new duties as manager of the Wisbech branch of the Eastern Electricity Board. He has succeeded **Mr H. K. Long** who has transferred to the sub-area staff. Mr Cobbold was previously manager of the Board's St. Ives branch.

Mr N. A. Davidson, B.E., A.M.I.E.E., A.M.N.Z.I.E, engineer to the Waitaki Electric Power Board, has been elected president of the New Zealand Electric Supply Authority Engineers' Institute for the next two years. He has had many years experience in the Supply Industry in the Dominion.

Mr F. E. Everard

Mr B. E. Hedley

OBITUARY

Mr R. A. Blakeborough, chairman and managing director of J. Blakeborough & Sons Ltd., of Brighouse, died on 3 Jan., aged 72. He had been ill for some time and was unable to attend on Saturday evening last the annual presentation of long service awards to employees of the firm. Mr Blakeborough himself headed the list, with 57 years with the company.

Lt-Col H. H. Vost, technical sales engineer and Midland representative for the Electric Construction Co., Ltd., died last week, aged 47.

Mr H. W. Rogers, formerly managing director of Pifco, died on 29 Dec., aged 87.

Mr C. F. Cogswell, A.C.A., secretary of Philips Electrical Co., died on 28 Dec., aged 55. He joined the company (then known as Philips Lamps Ltd.) as secretary in December, 1928, and as the concern grew he became secretary of many of the Philips subsidiary companies and also a director of several of them.

Mr C. F. Cogswell

Mr C. H. Nunn

Mr C. H. Nunn, A.M.I.E.E., manager of the Transformer Works of the General Electric Co., Ltd., collapsed and died as he was about to leave the works on December 22. He studied engineering at the Northampton Engineering College and joined the switchgear drawing office staff of the G.E.C. at Witton in 1924. Twelve months later he transferred to the Transformer Department, where he became chief designer in 1934, being appointed manager of that works in 1938.

Mr Alan Williams, M.I.E.E., who was a manufacturers' agent representing a number of electrical concerns for many years in London, died on 2 Jan., aged 82.

Mr A. W. Honeyman, commercial manager of the Carron Co., Ltd. for the past six years, died on 26 Dec. He had served with the company for nearly 50 years.

NEW YEAR HONOURS

Electrical Industry well represented

A NUMBER of prominent members of the Electrical Industry are named in the New Year's Honours List announced last Friday. Of particular interest are the awards to the chairman and deputy chairman of the East Midlands Electricity Board (Mr C. R. King and Mr J. Mould, respectively), and to the engineer-in-chief, and assistant engineer-in-chief of the G.P.O. (Dr W. G. Radley and Mr G. J. S. Little).

In the full list we note first the viscountcy bestowed upon **Lord Leathers,** C.H., who was until recently Secretary of State for the Co-ordination of Transport, Fuel and Power, and a baronetcy upon **Col Sir Joseph Nall,** who, among other things, is chairman of Trafford Park Estates Ltd., and of the Llandudno and Colwyn Bay Electric Railway Co. Among those who receive a knighthood are **Mr J. B. Elliott,** lately chairman of the Railway Executive, who is now chairman of London Transport Executive; **Mr Oliver Lyle,** O.B.E. (who gets the award for services in promoting fuel efficiency); **Mr H. J. B. Manzoni,** C.B.E., city engineer and surveyor to Birmingham Corporation; **Mr W. C. Puckey,** M.I.P.E., F.I.I.A., lately deputy Controller of Supplies (Air), Ministry of Supplies, but who is more familiarly known in our industry as a director of Hoover Ltd., with which concern he has been associated since 1935; and finally **Dr W. G. Radley,** C.B.E., B.SC.(ENG.), PH.D., M.I.E.E., engineer-in-chief and assistant director-general (Engineering) of the General Post Office.

We note that **Commander S. S. C. Mitchell,** C.B., O.B.E., R.N. (retired), Controller of Guided Weapons and Electronics, Ministry of Supply receives the G.B.E., that **Mr M. P. Murray,** undersecretary, Ministry of Fuel and Power, becomes a C.B., and that the award of the C.M.G. goes to **Mr N. C. Robertson,** M.B.E., ASSOC.I.E.E., F.R.S.A., who returned in December last to his civilian duties as deputy managing director of E. K. Cole Ltd., after being on loan for two years to the Ministry of Supply as director-general of electronic production.

Recipients of the C.B.E. include **Mr G. T. Bussey,** assistant secretary, Ministry of Fuel and Power; **Mr N. C. Chapling,** managing director of Cable and Wireless Ltd.; **Mr S. F. Burman,** managing director of Burman and Sons, and a director of Joseph Lucas (Industries) Ltd. and other concerns; **Mr C. R. King,** COMP.I.E.E., M.INST.F., chairman of the East Midlands Electricity Board, who has been largely responsible for a great deal of electrical development in the Midlands (prior to vesting day he was general manager of the Derby and Notts Electric Power Co., Leics and Warwick Electric Power Co. and Midland Electric Light and Power Co.); **Mr G. J. S. Little,** G.M., B.SC., M.I.E.E., assistant engineer-in-chief of the General Post Office; **Mr Cecil McGivern,** controller, television programmes, B.B.C.; and **Mr G. Darnley Smith,** chairman of the Radio Industry Council, who is also managing director of Bush Radio Ltd.

In the list of awards of the O.B.E. there are several recipients who are well known in the Industry. Among these are **Mr T. H. Baines,** M.I.E.E., deputy director of Radio Equipment (Production), Admiralty; **Mr H. Brown,** superintending mechanical and electrical engineer, Grade II, Air Ministry; **Mr Joseph Chamberlain,** chief enginer of Aiton and Co., Ltd.; **Mr J. H. Fraser,** chief officer (signal and telecommunications), British Transport Commission; **Mr Arnold Marsh,** director, National Smoke Abatement Society; **Mr A. S. Mitson,** A.M.I.E.E., assistant director, Electronics Production, to the Ministry of Supply; **Mr R. A. Moir,** M.I.E.E., chief telephone engineer to Standard Telephones and Cables Ltd.; **Mr P. E. Montagnon,** senior principal scientific officer, Ministry of Fuel and Power; **Mr John Mould,** A.M.I.E.E., who has been deputy chairman of the East Midlands Electricity Board since its inception and was earlier chief engineer and general manager of the Leicester Corporation Electricity Department for over twenty years; **Mr A. J. Nicholas,** A.M.C.T., M.I.E.E., director and general manager of South Wales Switchgear Ltd. and a director of Aberdare Cables Ltd. and Aberdare Cables (Holdings) Ltd.; and finally, **Mr M. J. L. Pulling,** M.A., M.I.E.E., senior superintendent engineer, television, British Broadcasting Corporation.

Mr W. C. Puckey

Dr W. G. Radley

Among those who receive the M.B.E. are **Mr J. S. Ball,** head of Design and Development Department, Henry Simon Ltd.; **Mr O. H. Barron,** engineer, Planning and Installation Department, B.B.C.; **Mr R. C. Birnie,** A.M.I.E.E., area engineer, G.P.O. Engineering Department, Aberdeen; **Mr J. L. Buchan,** director and manager of the Electrical Department of William Broady and Son Ltd., Hull; **Mr H. J. Cull,** assistant head, Department of Physics and Mathematics at Birmingham College of Technology; **Mr W. J. Dixon,** deputy contracts manager (pricing), Automatic Telephone and Electric Co., Ltd.; **Mr A. W. Dunlop,** engineering Superintendent, Short Brothers and Harland Ltd.; **Mr H. F. W. Golding,** chief inspector to the Northern Aluminium Co., Ltd.; **Mr W. H. F. Griffiths,** M.I.E.E., who, as chief engineer of H. W. Sullivan Ltd. for the past twenty-five years has been largely responsible for the great improvement in accuracy of commercial electrical instruments, particularly in the telecommunications field; **Mr H. J. Harbour,** test controller, E. K. Cole Ltd.; **Mr G. J. Hughes,** senior foreman, Laminated Department of Bakelite Ltd.; **Mr E. J. Jarvis,** M.I.E.E., deputy manager of the Surrey sub-area of the South Eastern Electricity Board, who was borough electrical engineer at Kingston upon Thames from 1936 to 1948; **Mr P. S. Kemsley,** works superintendent, Gas Turbine Combustion Production Factories, Joseph Lucas Ltd.; **Mr E. A. Musto,** senior executive officer, Ministry of Fuel and Power; **Mr. J. T. Sharp,** lately senior assistant engineer, Generation Construction Department of the South West Scotland Division, B.E.A.; **Mr J. D. D. Shaw,** managing director of James Kilpatrick and Son, Ltd., the well known Scottish electrical engineering concern, and **Mr J. Wilson,** general works

Continued on page 28

Mr C. R. King

Mr J. Mould

Mr N. C. Robertson

Mr A. J. Nicholas

NEW LITERATURE

D.C. Generators and Motors

By *J. E. Macfarlane*, B.SC.(ENG.), M.I.E.E., A.M.I.MECH.E.

PUTTING forward a simplified description of the principles, operation and construction of d.c. machines, this work provides a useful textbook for the elementary student whose immediate goal is the Ordinary National Certificate. Its straightforward style and clarity of explanation extends its possibilities beyond these horizons, however, and the less theoretically minded will find much of value from which to progress to more advanced studies. From its introductory section, which explains the action of both machines on conventional lines, the book considers essential components more fully, trisecting these into magnetic, electric and heat dissipating circuits. Both machines are treated as basically one machines put to two opposite purposes. Then follows separate consideration of dynamo characteristics, and later, motors, together with starters and speed control. Machine installation and testing is discussed fully, whilst their maintenance receives careful attention. A helpful feature is the provision of worked examples in the text, supplemented by a number of examples, with answers. Published by Pitman, 99 pages, 7¼ in. by 4¾ in. Price 8s. 6d.

Electrical Installation Rules and Tables

by W. S. Ibbetson, B.SC., A.M.I.E.E.
ed. by P. A. Rowland

FOR the fifth edition of this handy compendium for engineers, much of the previous material has been revised, taking into account the latest edition of the I.E.E. Regulations (together with the temporary relaxations) new definitions and data on lighting. It contains virtually all the information likely to be required by electricians and wiremen, and should also find a place on the bookshelf of the student studying C. and G. examinations in electrical installation work. Commencing with tables and data on units and conversion factors, and definitions, the book then gives a useful selection of the I.E.E. Regulations. Its next concern is with lighting, of which a compact and concise survey is given. Motor faults, current consumption and other data on a.c. and d.c. machines are set out, followed by calculations and tables of motor powers for machinery driving. Space and water heating is considered, and the book concludes with mathematical ratios, wire gauge. and pricing tables. Fifth edition, published by Spon, 210 pages, 4¾ in. by 3¼ in. Price 7s. 6d.

Electro-Magnetic Machines

by R. Langlois-Berthelot, M.I.E.E., M.A.I.E.E.

AS against the practical viewpoint of English and American writers on this subject, the abstract manner, which the author has adopted brings a feeling of novelty—one of the most immediately noticeable features of this excellent and erudite study. For its clarity tribute is due also to the translators, Lt-Col H. M. Clarke, T.D., M.SC., M.I.E.E, and C. W. Marshall, B.SC.(ENG.), M.I.E.E., and its standing in the world of technical literature is enhanced by the way in which the author discusses the machines as seen through the different eyes of designer, and operating engineer. There is little doubt that it gives all the information required by electricity supply engineers to enable rational and logical power plant specifications to be made, and such plant to be operated at maximum advantage.

Divided into six main parts, the book opens with a consideration of machines grouped in various families. Main properties of such groups, and their chief applications are reviewed, giving a broad picture of the subject from which to tackle each part in turn. In the second part, the constitution of electrical machines is studied exhaustively, introducing the various laws which govern machines' operations and then applying those laws, in turn to specific families. The section serves to pass from the material to the symbolic consideration of each machine. In part three, the machine is approached from the designer's viewpoint, discussing properties of materials and the effect of operating conditions. Following logically comes the section wherein the operating engineers attitude defines the approach. Machine specifications, standardisation, machine operation and characteristics are some of the factors discussed. Abnormal operating conditions — unbalance, harmonics, and transients—are studied in the penultimate section, leading to the final part—a miscellany of general comments, philosophical in character. Published by Macdonald and Co. (Publishers), Ltd., 535 pages, 8½ in. by 5½ in. Price 65s.

BOOKS RECEIVED

Electricity and Magnetism, by E. R. Peck. Discusses principles of electromagnetism, including field and circuit theory, for graduate level. Published by McGraw Hill, 476 pages, 9 in. by 6 in. Price 60s.

Microwave Spectroscopy, by M. W. P. Strandberg. Part of publisher's monographs on physical subjects, for graduate students and research workers. Published by Methuen, 140 pages, 6½ in. by 4 in. Price 9s. 6d.

Tables of Coefficients for the Numerical calculations of Laplace Transforms, by H. E. Salzer. Facilitates the numerical evaluation of infinite integrals expressible in the form of Laplace transforms, giving applications and illustrations of various uses of the book. Published for the National Bureau of Standards, U.S. Department of Commerce by the U.S. Government Printing Office, Washington 25, D.C., 36 pages, 10¼ in. by 8 in. Price 25 cents.

Wade's Tables. Pocket Edition, 1953. Designed to meet the requirements of countries where Red Fir and similar timbers are used to support o.h. power lines. Published by Gabriel, Wade and English Ltd., Southern Chambers, Waltham St, Hull, 33 pages, 7¼ in. by 4¾ in. Price 5s.

Industrial Electronics, by Dr R. Kretzmann. Presents general principles of electronics as applied to modern industry, for enginers and technicians. Published for Philips' Technical Library by Cleaver Hume, 236 pages, 9 in. by 6 in. Price 25s.

Radio Receiver Design. Part One, by K. R. Sturley. Extensive revision to improve clarity, for radio engineers. Second edition, published by Chapman and Hall, 667 pages, 8½ in. by 5¼ in. Price 56s.

New Year Honours (*contd. from p. 27*)

manager, Blaw Knox Ltd., the engineers.

The lengthy list of awards of the B.E.M. includes the names of **Mr T. H. I. Adams,** foreman, Plymouth district, Devon sub-area, South Western Electricity Board; **Mr T. Carmichael,** substation attendant, Fife sub-area, South East Scotland Electricity Board; **Mr H. T. Chapman,** chargehand fitter, Barnsley power station; **Mr J. J. Charnley,** chargehand electrical fitter, Ribble power station; **Mr J. E. Colley,** turner and borer, Lancashire Dynamo and Crypto Ltd.; **Mr B. V. Cook,** lately foreman stoker, London Division B.E.A., Sidcup; **Mr. C. W. Gale,** electrical engineer, N.A.A.F.I., North Harrow; **Mr W. Gleave,** substation attendant, Northwich, Merseyside and North Wales Electricity Board; **Mr G. W. Leaper,** foreman fitter, Brighton, South Eastern Electricity Board; **Mr R. J. W. Lees,** crane driver, North Welford power station; **Mr A. J. Pratt,** senior chief supervisor (M), London Telecommunications Region; **Mr S. Ringwald,** electrical engineer with British Resin Products Ltd.; **Mr E. R. Sellars,** foreman electrician, Ransome and Marles Bearing Co.; **Mr F. Smith,** colliery head electrician, East Midlands Division, N.C.B.; **Mr G. Wilkins,** experimental mechanician, McMichael Radio Ltd.; **Mr J. W. Brookes,** M.M., technical officer, telephone manager's office, Gloucester; **Mr J. W. Dodds,** leading technical officer, P.O. Telephone Exchange, West Hartlepool; and **Mr E. A. Farenden,** inspector, Signal and Telecommunications Department, Executive, Southern Region, Woking.

Overseas recipients of awards include **Mr E. C. Fernando,** B.SC.(ENG.), M.I.E.E., chief engineer and manager, Department of Government Electrical Undertakings, Ceylon, gets the M.B.E., and **Mr R. T. Stevens,** M.B.E., director, electricity and telephones, Mauritius, and **Mr J. W. Jehu,** lately deputy director and engineer-in-chief, Posts and Telegraphs Department, Nigeria, both receive the O.B.E.

PROBLEMS AND PRACTICE

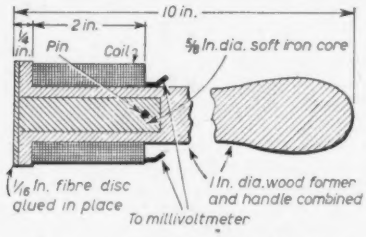
In Engineering

Field Polarity Check

I HAVE been interested in the subject of "Field Polarity Check" dealt with in these columns and so far nothing has been said about what I consider to be the only safe, sure way of testing polarity. I think to make this discussion complete, the method we have adopted, based on many years' experience, is far the best. As a Chief Tester I found it much more reliable than the use of a compass needle, being quicker and perfectly definite, which the other methods are not. I hasten to point out, however, that the methods already described are quite correct but still not as reliable, I feel, as my method has been proved to be in service.

The obvious way, using a compass needle or similar device, suffers from the fact that the needle polarity can so easily be reversed during the test unless a weak field is used. The use of an iron bar as a keeper between poles and comparing the pull required to drag it away is more certain but is still inconvenient and not always can it be adopted.

A more scientific method is to use a search coil connected to a millivoltmeter when the search coil is moved towards the pole tip of say a north seeking pole the deflection of the millivoltmeter is in the opposite direction from that obtained when moved towards the pole face of a south seeking pole. By this means is afforded a rapid and perfectly definite test.



Here is seen a side elevation of the search coil for checking field polarity

The method of constructing a search coil is illustrated herewith, and the coil being readily adapted from a standard "110-volt" coil of a starter or similar unit.

At the same time that the polarity test is made, the drop in voltage across the individual field coils should be checked and if the field current is measured a check of the coil resistance is recorded.

The millivoltmeter, preferably of the centre zero type, can once and for all be standardised so that (for example) a "pull-away" from a north seeking pole indicates a definite direction of meter kick. This is done by using originally a relatively large permanent magnet of known polarity, its polarity being checked by suspension or by use of known laws. The use of a compass needle alone does not cover the case where permanent magnetism, not produced actually by the coil on the pole, is enough to give indications on the needle. The search coil reading becomes known to be of a certain value for pole having excitation of usual values, and gives an indication when very weak fields are in existence, such as that from residual alone.—*E. P. H.*

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

THE methods of checking the polarity of the field winding in a d.c. machine suggested recently would, in some instances, be inconvenient due to inaccessibility of the inner part of the motor or generator, whichever the case may be. A safe and convenient way to check the polarity by means of a magnetic-compass is by bringing the latter close to the heads of the fixing bolts of the particular pole being checked. These bolt heads are projecting from the frame of the machine, and there is no danger in approaching them if it is desired to carry out the test whilst the machine is running. In the case of machines in which the pole magnets are cast integral with the frame it is easy to determine the position of the centre line of each pole either by inspection or by moving the compass round the frame and watching its behaviour.—*R. A.*

METHODS described in your issues of 3 and 10 Dec., 1953, for testing the polarity of d.c. motor field windings are interesting, and readers may find this additional method useful. Known as the "spanner method," it requires only a spanner of length equal to or less than the pole pitch, and is based on the rule "like poles repel—unlike poles attract."

With the pole-pieces energised, place one end of the spanner on one pole-piece and gently bring the other end of the spanner towards an adjacent pole-piece, noting the extent of the pull on the spanner when the magnetic circuit is nearly closed. Repeat this test on every adjacent pair of pole-pieces and if the pull on the spanner is equal and pronounced in every case the sequence of polarity is correct. If one field coil is reversed, the free end of the spanner may actually be repelled as it approaches the adjacent pole-piece, or at least the pull will be relatively weak. The method needs no special apparatus, and the user soon gets the "feel" of the spanner.—*R. Paterson.*

(This correspondence is now closed.—Ed.)

C.T.'s in O.C.B.'s

WITH further reference to my remarks on this subject (26 Nov., 1953) I would like to emphasise the paragraph I singled out for criticism from your contributor "1066" wherein he stated: "Any form of circuit-breaker isolation that occasions the open circuiting of current transformer is fundamentally unsound and should be discouraged."

I am personally concerned with an area containing over 300 o.c.b.'s operating up to 11 kV consisting of all types produced by leading British switchgear manufacturers. I must say the trouble I have experienced over some 25 odd years with failures due to bad current-transformer secondary contacts have been infinitesimal and only then where the non-plugging type of circuit-breaker is concerned, such as a kiosk substation, where the o.c.b. is not capable of being isolated by un-plugging from bus-bars. This latter type of o.c.b. current transformer contact trouble has been generally due to vibration from road traffic, where the kiosk is situated near a roadway, and stresses the importance of periodical tests and checks on possible loose connections.

I do, however, agree that any form of plugging contact on low voltage circuits, such as current transformer secondaries, is bad, but rather a necessary evil due to the construction of o.c.b's and the position of c.t.'s in relation to the o.c.b. trip circuit using a.c. for its operation. The use of d.c. operated trips, of course, does away with the necessity for c.t. plugging contacts but the additional cost of operating relay with battery and trickle charger may rule out its incorporation, although I must say I prefer the inverse time lag relay with 30 volt d.c. trip as opposed to direct two O/L and one E/L c.t. operated a.c. trip with time limit fuses, from a grading point of view alone.

On the installation of any new o.c.b., I always make a careful check of all c.t. terminal connections, etc., and lock nuts or locking washers are fitted where applicable. Even then, after a period of service, it is often necessary to retighten these to ensure continued efficient operation of trips. The renewal of time limit fuses is also advisable after a period of service, depending upon loading and "near faults" which may have been cleared on the l.t. side before t.l.f. on e.h.t. side had blown.—*H. W. R. Ogden.*

Equipment for Industry

New "Gilflex" Conduit and Fittings

MAKING its debut with 1954 is a new wiring system which is introduced by GILFLEX CONDUITS LTD., 41 The Parade, High St, Watford, Herts. Based on the original "Gilflex" method, the new system uses thicker walled conduits and a new range of watertight conduit accessories and lighting fittings. Thicker walls enhance the value of the self threading characteristics of the conduit when screwed into accessory spouts, whilst the provision of watertight fittings of moulded phenolic resin makes it particularly suitable for wet, or corrosive atmospheres.

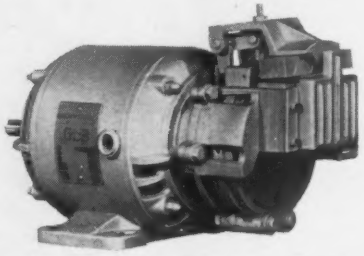
Five sizes of conduit are now available, although the ability to telescope different sizes permits the use of only one range of conduit accessories. Conduit entries for these are designed to accept the largest size of conduit ($\frac{7}{8}$ in. o.d. by $\frac{3}{4}$ in. i.d.) but by the use of bushes made up from this and smaller sizes, or conduit connectors, the entries can be made to accept the remaining four sizes. Normally, sealing compound is not required between conduit and accessory, but where bushes are being used its use ensures a watertight join between the bush and conduit.

The one size of entry applies also to the range of switches available, each unit being housed in a moulded plastic case. Two current ratings are provided, 5 A and 10 A at 250 V and in each size, one-way and two-way, d.p. and series/parallel switches can be obtained. Broadly two types of lighting fitting are available, bulkhead and well-glass. The former may be obtained for 60 or 100 W lamps, as a terminal or through unit in each case. Having an all-insulated, corrosion proof, aluminium sprayed base, it is supplied complete with either b.c. or e.s. lampholder. The well-glass type, watertight, corrosion proof and fitted with screw-neck well-glass, may be obtained with wire guard, and reflector if desired or with a white opal globe in place of the well-glass.

Magnetic Motor Brake

A NEWCOMER to the field of motors and associated equipment is seen in a 4 in. magnetic brake, manufactured by BROOK MOTORS LTD., Empress Works, Huddersfield. The unit is eminently suitable for mounting integrally with its electric motor to take advantage of the inherent interlocking which is characteristic of such brakes when energised jointly with the power unit.

Assembled on a cast iron back plate, the brake is thus arranged to be mounted directly to the motor, whose shaft should be extended to take the brake drum. As it can be offered with the company's "Gryphon Cub" f.h.p. motor, fixing holes on the back plate are for fitting to such motors. Centres can be modified, however, to permit its mounting on

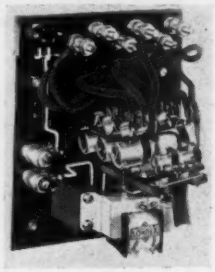


Brook Motors' four inch magnetic brake mounted on a "Gryphon Cub" motor

motors of different manufacture. Braking is effected by a toggle action against a spring which holds the brake shoes on to the drum. Hence when the solenoid is not energised, the brake is applied, giving a maximum dynamic frictional torque of 10 lb.ft. When the coil is energised, the main operating area on which the armature is mounted is drawn inwards towards the drum centre. A crosshead connects the arm and toggle joint, which is thus forced inwards at the same time, the ends of each arm of the toggle opening the brake shoes against the tension exerted by the spring. Adjustment of the distance between the toggle joint and the operating arm is effected by means of a screw on the outer end of the crosshead. This enables a constant gap between magnet faces to be maintained, ensuring that the coil will operate within its stated voltage range and also compensating for wear in the brake lining.

Mercury Switch Relay

EXTENDING their range of LQA mercury switch relays, LONDEX LTD., 207 Anerley Rd, S.E.20, now market a new heavy duty 60 A triple pole unit. Using an economy resistor in series with the relay coil, its consumption has been limited to 9 VA. The contactor may therefore be controlled by a thermostat or similar low-power devices.



Rear view of the latest Londex LQA mercury switch relay

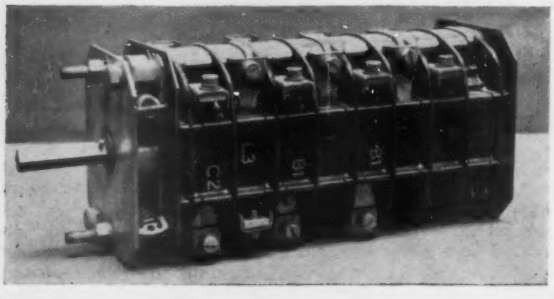
For use at voltages up to 500 V, the contactor has a wide industrial application, particularly in chemical works or hazardous situations and where space is limited. Control of pump motors, heating and lighting loads and other circuits are now brought within the range of this type of contactor. The unit is available baseplate mounted or in sheet metal or cast iron boxes. (Londex List No. 159.)

Rotary Multi-pole Switch Unit

AN "on-load" main current rotary switch, now available from BROOKHIRST SWITCHGEAR LTD., Northgate Works, Chester, utilises the cell type of construction to obtain multi-pole arrangements. Known as type 303, the unit is manufactured in two sizes of current carrying capacities of 30 A and 60 A respectively at 550 V a.c./d.c.

Of robust and compact construction, the switch is claimed to have making and breaking capacities considerably larger than the nominal rating, and high for the switch size. Roller contacts are employed, "dumb-bell" shaped, moving contact rollers bridging a pair of fixed strips when in an "on" position, thus providing a double break. By virtue of the rolling action, wear is evenly distributed whilst the faces are kept clean. A cam-operated, spring-loaded mechanism controls the four positions of the switch.

Although intended primarily for use on individually driven machine tools, being suitable for forward/reverse motor control, or multi-speed change-pole motors, the design suggests possibilities for extension outside this field. It meets the requirements of most types of main, and control circuit switching, and can also be applied to transformer switching.

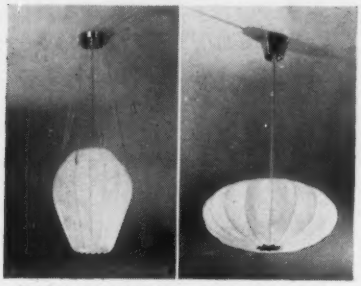


The compact and sturdy design of the Brookhirst multi-pole rotary switch is well shown in this illustration. Cable anchoring arrangements on the terminals are positive and easy of access.

New Chrysaline Fittings Produced

FIVE new patterns have been added to the Chrysaline range of domestic lighting fittings marketed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.

These are simple in style and competitive in price. Two of them strike a fresh note with fine gossamer-like gold suspension cords. All five are listed at £3 18s. each plus 13s. purchase tax and are in White Chrysaline (a sprayed on plastic) with polished brass metalwork (ceiling plates and pendant rods or suspension cords).



F30046 & F30054 are examples of the Chrysaline domestic range

The "Utilux" Range Extended

A NEW range of "Utilux" fluorescent lighting fittings has been produced by THE EDISON SWAN ELECTRIC CO., LTD., 155 Charing Cross Rd, W.C.2.

This new series is based on the Ediswan power-pack improved control gear and comprises one or two lamp channels solidly constructed from sheet metal "bonderised" and cream stove enamelled with sides panelled for additional rigidity and die cast aluminium end plates with knock-outs for end entry.

All wiring is "Polychloroprene" insulated, colour coded and securely cleated to the channel. Starter switch is accessible externally at the side of the channel and the company's patent "Pendicone" fixing method is again incorporated in these new models.

A number of alternative reflectors are available for use with these power packs to form a complete range of lighting fittings for installation in industrial premises. They include steel reflectors finished in high gloss white enamel vitreous or stoved and white "Perspex" reflectors.

TRADE PUBLICATIONS

DOMESTIC APPLIANCES.—A gay, but uniform series of leaflets has been published by The English Electric Co., Ltd., Queens House, Kingsway, W.C.2, describing their complete range of domestic equipment.

RADIO AND ELECTRIC COMPONENTS.—A completely revised 144 page component catalogue issued by A. F. Bulgin and Co., Ltd., Bye Pass Rd, Barking, Essex, is available to traders, factors, manufacturers and amateurs alike price 1s. post free from the company.

Now TeBeam Immersion Heaters

TWO immersion heaters have been added to the range of products produced by T. B. MORLEY AND CO., LTD., Jameson St, Hull.

The company emphasise that without sacrificing anything in the quality of the heaters they have re-costed and produced heaters with competitive prices.

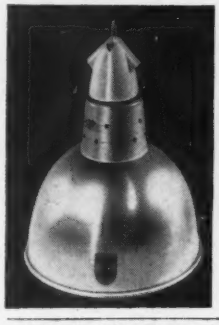
The type S. 12 heater is 12 in. long loaded at 2¼ kW for 230/240 V supplies, has metal sheathed embedded elements and a pocket for an 11 in. thermostat with packing washer included. Price is 43s. plus 23s. 8d. purchase tax. An 11 in. a.c. thermostat is priced 28s.

The type S. 263 heater of the circulator type is 26 in. long, rated at 3 kW and is for 200/210 V or 230/240 V supplies. Again the embedded elements are metal sheathed and a pocket for a thermostat is included. Price is 46s. plus 25s. 4d. purchase tax whilst an 18 in. a.c. thermostat is priced 28s. Circulating tubes are available at 12s. 6d. (no tax).

Cheaper Chick Rearing

BY the introduction of their "Infra-glo" poultry brooder PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Ave, W.C.2, have placed within reach of domestic poultry keepers all the advantages available to the professional.

This new brooder which comprises an infra-red lamp, lampholder and protective canopy provides all the advantages of this aid to rearing at a price of 28s. 6d. The makers claim that it is economical in operation consuming 1 unit of electricity in 7 hours and has a life of 5,000 hours.



The fitting brings infra-red hover within the pocket of the amateur breeder

Mazda Silverlight Counter Display

TO emphasise the advantages of the "Silverlight" lamp (internally silica coated) by comparison with a pearl lamp THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2, have produced a four-colour display unit with the wording "Mazda lamps stay brighter longer" in front of which a model of the Mazda dancing girl is flanked by Pearl and Silverlight lamps.

For the Electrical Trade

•

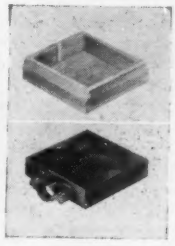
New 'Lincoln' A.C. Switches are Here

JUST offered to the trade by J. A. CRABTREE AND CO., LTD., Lincoln Works, Walsall, Staffs, is a new flush tumbler switch.

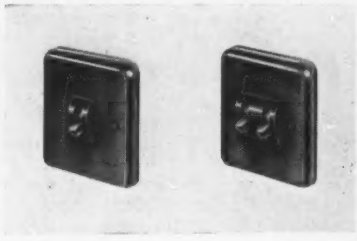
Designed by the company to provide a low cost easily installed and maintained switch for housing work the new Lincoln 5 amp a.c. flush switch should give the user a long life of unfailing service.

The short break principle widely used in a.c. switching has been adopted in this model which has a small switch unit leaving ample space for cables and slack. When two switches are needed in one place, e.g. for halls and stairways, they can be mounted as a single unit in a one gang extra shallow or B.S. 1299 box. The switch mechanism is protectively sealed against dust and operates silently. Contacts are of heavy gauge silver-faced copper with pressure springs lightly stressed and not used as current-carrying components. The range includes one and two way single switching units and twin switch units with two 1-way, one 1-way and one 2-way, or two 2-way switches in brown or cream finishes.

For use in installation of these switches Crabtree's have also provided a range of mounting boxes which include a pressed steel box as an alternative to the cast-iron pattern which embodies six knock-outs for ¾ in. conduit and six for ⅝ in. conduit giving a choice of entry on all sides of the box and at the back. Four new plaster depth boxes are also available, one is a hardwood box and the others a steel box with one or two bushed entries and shallow steel boxes with "grip" for ¾ in. or ⅝ in. conduit.



The Lincoln a.c. switch is available as a 1 or 2 way unit (List Nos. 2020 & 2022 (right). These mounting boxes List Nos. 9051 (top) and 9252 have been provided at the same time



NEWS OF THE WEEK

Deadlock on Electricians' Wages

Union threatens to resume "Guerilla" Tactics

ELECTRICIANS in the contracting industry are to strike again in an effort to enforce the claim for higher pay. The E.T.U. is to call a one-day strike on 18th January and "guerilla" strikes at selected sites are to be restarted. From news we have the situation seems ominous. Since the Court of Inquiry issued its report on the "guerilla strikes" initiated by the Electrical Trades Union in August last, following rejection of their claim for a wage increase for electricians, several meetings have taken place between officials in the National Federated Electrical Association and the E.T.U. on the matter.

It will be recalled that the Court of Inquiry suggested that "there should be another early meeting of the N.J.I.C. and an earnest endeavour made by both sides to resolve outstanding differences and especially to determine whether the present wage claim should be solved on the basis of the cost of living and, if so, whether the datum line for assessing that claim should be June 1947, January 1948, January 1952, or some other acceptable starting point."

Despite the fact that both sides have met on a number of occasions in the past ten weeks or so, discussions have once again resulted in deadlock, we understand. The Association have suggested the matter should go to arbitration, but the E.T.U. are against that course. In a recent letter the Union declared that unless they heard further from the Association they would instruct members that they could take action. This has been construed by the N.F.E.A. as a threat of strike action, and an emergency meeting of the Executive Council is being held this week. On Monday conciliation officers of the Ministry of Labour met Union officials in an unsuccessful effort to evolve a peaceful settlement.

Conference on Shortage of Science Teachers

THE shortage of science teachers, an important current problem, will be discussed at a one-day conference being arranged by the F.B.I. Particular aspect of the problem to be discussed will be its effect on industry and possible solutions. The conference will take place on 14 January at the I.E.E.

Delegates will include representatives of industrial firms, from universities, public and secondary schools, technical colleges, central and local authorities. The Federation's president, Sir Harry Pilkington, will open proceedings. Other speakers include Sir Charles Morris, Dr A. W. Barton, and Dr P. Dunsheath.

B.E.A. Borrowings Now Stand at £80m.

A FURTHER statement of guarantee has been issued by the Treasury in respect of loans proposed to be raised by the B.E.A. during the first quarter of 1954. The guarantee was given on 15 Dec., and concerns temporary borrowings from the Clearing Banks, Scottish Banks or other persons which must not at any time exceed £80 millions. This replaces the previous guarantee given by the Treasury on 25 Sept. The figure was then £60m.

E.P.E.A. MOVE TO IMPROVE STATUS

A SMALL "Action Committee" has been set up by the Electrical Power Engineers' Association in connection with its recent claim for rise in status (which we noted on 10 Dec.). This committee consists of the president, Mr Jack Jones, the president-elect, Mr Ernest Hanson, the vice-president, Mr J. Parr-Morley, and the general secretary, Mr H. Norton. The Association, as we have stated, is determined to take immediate and drastic steps to improve the status and salaries of the technical staff in the Electricity Supply Industry. As an initial step, the Committee has asked Lord Citrine for a direct meeting with members of the Authority and representatives of the Area Boards, we understand. At such a meeting the broad issue could be discussed before a formally stated claim is presented through the normal negotiating channels.

India announces 1954 Import Policy

LITTLE change has been made by the Indian Government in its import policy for the first half of 1954. The official announcement last week stated that alterations had been made only "such as experience has shown to be necessary for sustaining the tempo of industrial development." Import quotas of 22 items have been increased while quotas of 34 items have been reduced; duplicators and copper wire are included among the latter.

The new policy also makes provision for the granting of additional licences to established importers for increased imports of some machinery and scientific instruments. The list of items open to newcomers and actual users has been enlarged to include a further 17 items, including domestic refrigerators. The system of grouping has been extended.

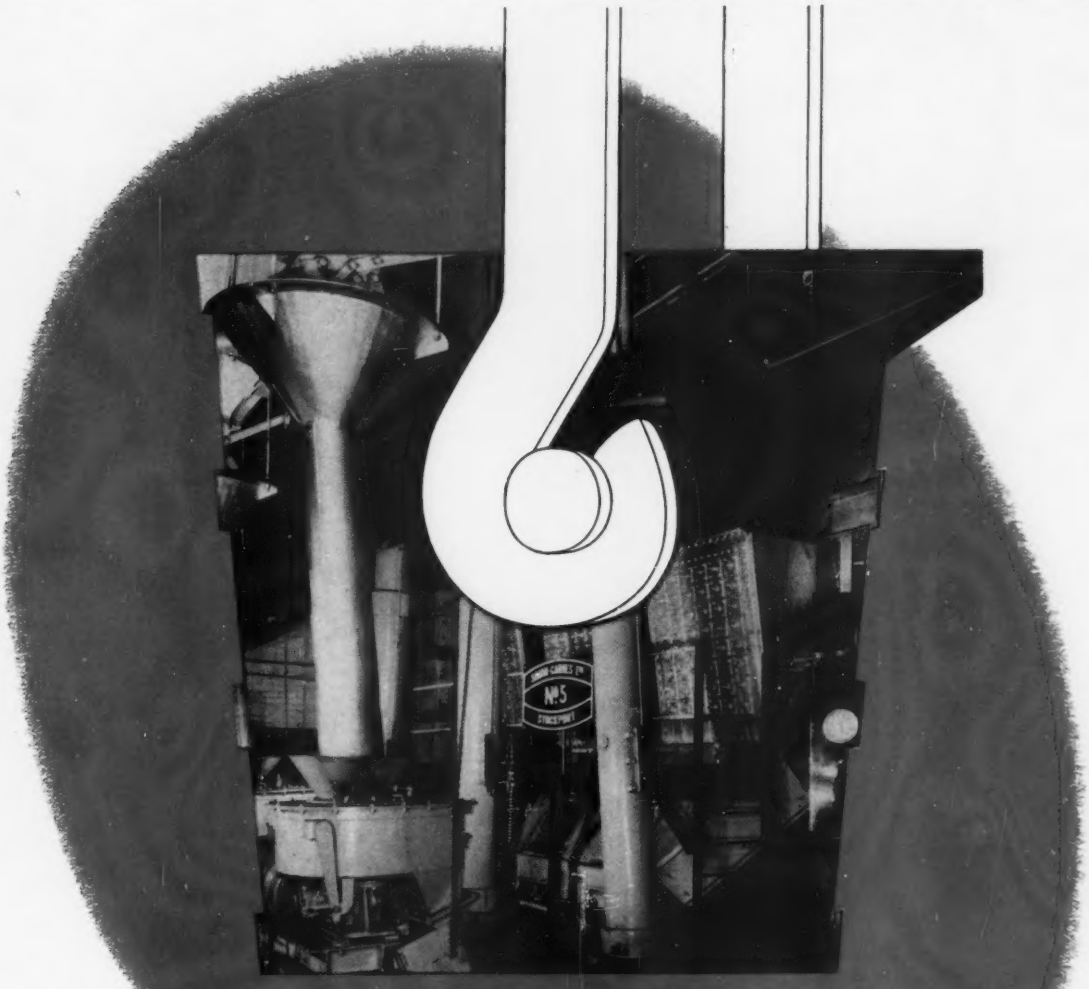
MORE PURCHASE TAX REDUCTIONS

Chancellor's New Year Announcement will help Retailers

PURCHASE TAX on a number of electrical domestic appliances has been reduced as a result of a Treasury announcement on Monday. Retail distributors will be particularly grateful to the Chancellor of the Exchequer for this timely announcement, coming as it does so soon after the Christmas rush when stocks are at their lowest. Total reduction of tax involves some £2 million.

The changes which affect the electrical industry are as follows: Washing machines which are designed for heating water by electricity or gas but which are not otherwise designed for operation by electricity or gas will in future bear a 25% tax. They were formerly chargeable at 50%. This alteration does not affect motor-driven machines which remain at 50%. Tax on electric space heaters and water heaters, which previously stood at 75% has now been reduced to 50%. Another item included in the alterations is fabric lamp shades. They are now taxed at 25% instead of 50%. The alterations are operative as from January 6.

Retailers have been pressing for some months now for some system whereby they could avoid the losses incurred on unsold stocks at the time of purchase tax reductions. A system of rebates although workable in many cases was not considered the most satisfactory solution. An alternative suggestion was that any changes should be announced in January, usually the month when stocks are lowest. The Chancellor received many representations on the subject and a number of questions were asked in the Commons. To all these, Mr Butler reiterated the assurance that the matter was receiving special consideration.



STEAM *and the making of steel*

The general expansion in steel production is making complementary demands on Simon-Carves steam raising plant for electricity generation. Four Simon-Carves 87,200 lb/hr boilers have been installed at the Margam works of the Steel Company of Wales and the picture above shows one of the units in a recently commissioned addition of two 100,000 lb/hr boilers in the Simon-Carves boilerhouse at the Ebbw Vale steelworks of Richard Thomas & Baldwins Ltd.

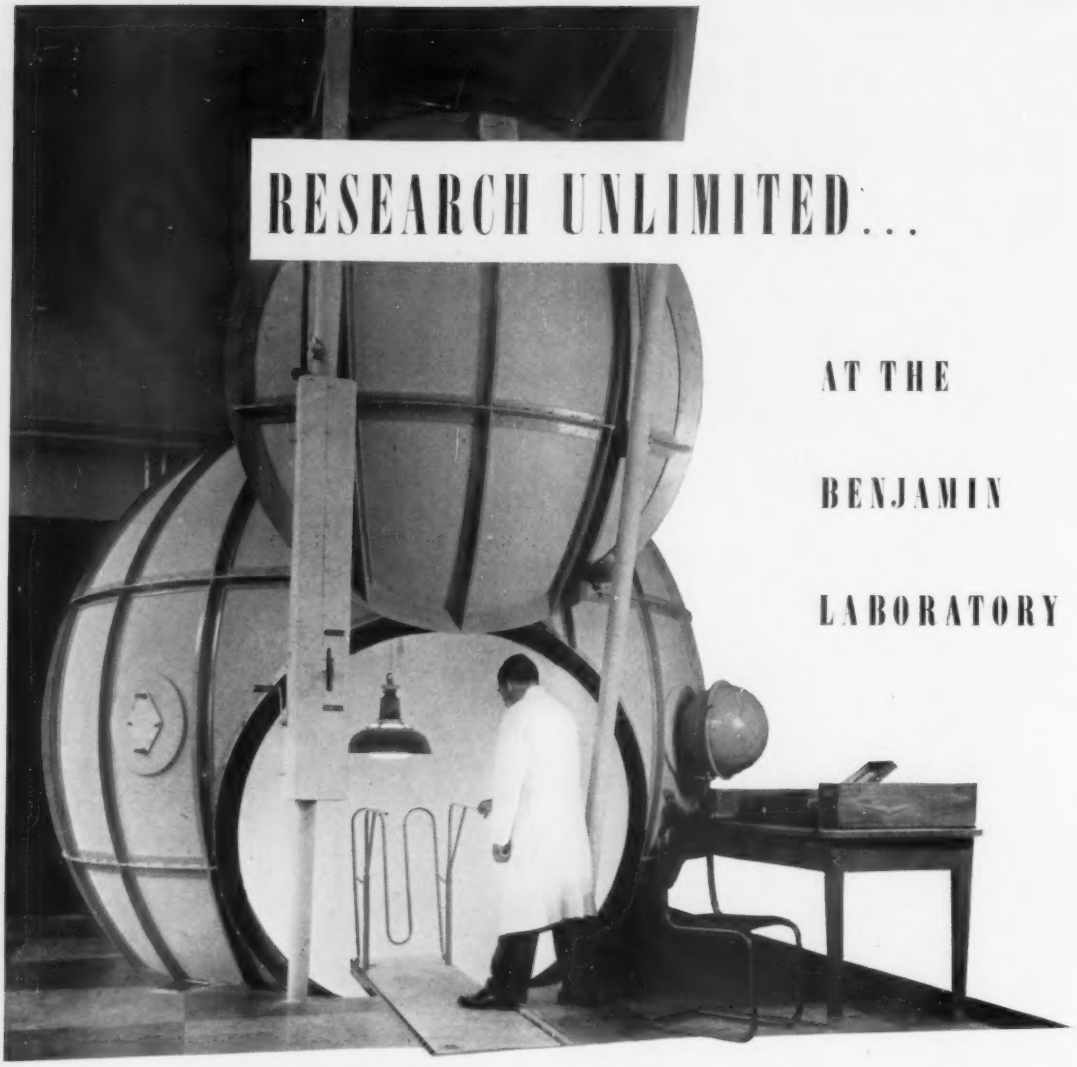
Steam power by **Simon-Carves Ltd**

SIMON ENGINEERING GROUP

STOCKPORT ENGLAND

OVERSEAS COMPANIES | *Simon-Carves (Africa) (Pty) Ltd : Johannesburg* *Simon-Carves (Australia) Pty Ltd : Sydney*

S.C.96



RESEARCH UNLIMITED...

AT THE BENJAMIN LABORATORY

Each thriving business has chosen a different route to success. Our route can be described in one word—"Research". This explains why we, the Benjamin Organisation, have built the most up-to-date laboratory of its kind.

The giant photometric sphere illustrated is only one of the laboratory's unusual features. Electronic "eyes" record the amount of reflected light from fittings being tested within the dome. Benjamin fittings destined for all corners of the world must be proved to function perfectly in EVERY way.

To test the industrial lighting equipment of today; to design that of tomorrow; these are the jobs of the men in the laboratory. Their patience and zeal together with the most modern of production plants create and, ultimately, give you . . .

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LEEDS
49, BASINGHALL STREET, LEEDS, 1 Telephone: Leeds 25579

Smee's 153

Bulk Supply Charges revised from April 1 Electricity will cost on Average about 1% More

AS foreshadowed in the B.E.A.'s fifth annual report and statement of accounts for 1952-53, the bulk supply tariff for Area Boards has been revised. The alterations will become operative on 1 April and are expected to increase the cost of supplies to the Boards by about 1%. The increase as it affects individual Boards will, of course, vary. Briefly, the changes are as follows. The kilowatt demand charge has been raised from £4 5s. 6d. to £4 15s. The basic running charge has been revised from 0·33d. to 0·5d. per unit, and the fuel price adjustment figure reduced from 0·0007d. to 0·00065d. per penny variation in the cost per ton of fuel. A more suitable figure of 60s. has been adopted for the basic cost of coal per ton instead of 38s. Full details of the new tariff are given among our advertisement pages (46).

One of the most outstanding changes is the increase of 9s. 6d. in the kW demand charge. This is the largest increase imposed at any one time. At vesting day, the charge was fixed at £3 10s., and in April 1950 it stood at £3 15s. The increase is designed to counter a rise in capital charges and other fixed costs. Continuing improvement in the thermal efficiency of power stations has facilitated the reduction in the running charge. The former charge of 0·33d. per unit was fixed in 1951. The reduction of the fuel price adjustment figure is the first such alteration to be made, as hitherto it has remained at 0·0007d since vesting day. Finally, the basic price of coal at 60s. per ton is more in keeping with the present cost than the 38s. fixed on 1 April, 1948, in view of the many increases in price in the six years between.

How will this affect charges made to Area Boards? Under the new tariff with the 60s. basis the running charge will be ½d. per unit; on the same basis under the old tariff it would have been 0·5148d. The cost per unit adjusted from the coal price at 38s. a ton at 0·00065d. would be 0·5016d.

Not perhaps as striking, but no less important, is the question of the measurement of demand. This will be on weekday demand between 7 a.m. and 7 p.m. and on Saturday demand between 7 a.m. and noon. If that is exceeded by demand at other times, no extra charge will be made. The previous clause concerning other hours is now omitted.

The First Half-Century

Spending millions on universities may be very pleasant for the professors, but it will not avail much against foreign competition. How can any amount of technical training make it possible to undersell German steel, the price of which is always put at something lower than the English price, however that may be reduced? As well depend on university education to fight the Russian fleet should that contingency arise. Nevertheless, the great change in the conditions of industry due to the advance in machinery and the economy of repetition production has profoundly affected all problems of wealth and labour, and made the old political economy inadequate to our present needs. Suppose it were true, as Prof. Perry imagines, that there is no longer a place for the unskilled labourer, it would be a serious question what to do with him.—*From our issue of 7 Jan.*, 1903.

Textbook for Salesmen

SALES representatives of Area Electricity Boards and authorised dealers attending future training courses given by Mr J. C. Andrews of the English Electric Co.'s domestic appliance division, will undoubtedly benefit from a new sales manual just produced. It is called "How to Sell English Electric Domestic Appliances" and will make its debut at Mr Andrew's next course in Cardiff next week. Introductory pages give a general basic guide to selling. This is followed by detailed illustrations and selling features of the company's appliances.

SAFETY AND HEALTH IN COAL MINES

ONCE more the Ministry of Fuel and Power has collected in one volume the "Regulations and Orders relating to Safety and Health" made under the Coal Mines Act, 1911. The latest edition is dated 1953, and is brought up to date as at 31 Dec., 1952. The arrangement follows the well tried form of division into four parts. The first of these contains all existing amendments to the 1911 Act. Part 2 sets out the general codes of regulations, together with all other regulations and orders. Part 3, which is mainly for students, refers to the Mining Qualifications Board, while Part 4 sets out approved apparatus, excluding electrical flameproof apparatus. The volume is published by H.M.S.O., price 4s.

Campaign planned against Merseyside Tariff

A LEADING industrialist at Widnes has stated that he is to open a campaign to alter or abolish the Merseyside and N. Wales Electricity Board's Tariff 6, which, he says, is crippling industry. The campaign is to be launched at this month's meeting of the district's Industrial Development Council, when the support of Chambers of Commerce will be sought. Main objection to this particular tariff is apparently that if management wish to increase the amount of electricity consumed to the maximum possible, they have to agree to pay a full year's charges on the basis that consumption has been at the maximum throughout the year. In actual fact, the objector asserts, maximum consumption may have been taken for only a very brief period. This, he says, is what is crippling industry.

In answering this criticism, the Electricity Board has pointed out that commercial and industrial consumers have the choice of eight tariffs. Tariff 6 which, subject to a maximum demand charge of £650 a year, enables the consumer to buy electricity at ·6d. a unit. If the maximum demand which was budgeted for, was exceeded, the maximum demand charge is increased appropriately.

MEB will Welcome Industrial Development

A SIGN of the times comes from a speech made by Mr J. H. Davis, Banbury district manager of the Midlands Electricity Board, at the fourth annual dinner of the local branch of the Board's Sports and Social Club. There appears to be no fear now as to whether the supply industry can meet all the demands made upon it. Mr Davis confidently stated that when further industrial development came to Banbury, the Board would be ready and waiting to provide the necessary power. He added, furthermore, that the Board would welcome industrial development because they had the plant and equipment to cope with anything that came their way.

At the recent annual dinner of Ferranti Ltd's Long Service Club, gold watches and certificates were presented to 20 new members who had completed forty years' service. Sir Vincent de Ferranti is congratulating Mr Henry Latham.

1954 Exhibition of Mechanical Handling

WITH the arrival of 1954 many minds will immediately turn to the Mechanical Handling Exhibition and Convention which will be held again this year. Held biennially, the next display will be the fourth, and, at this early stage, it is known that space occupied will easily exceed that taken at the previous exhibition in 1952. This is probably the largest exhibition of such equipment in the world. The 1954 show will take place at Olympia, London, between 9 June and 19 June.

All types of labour aids will be shown and the majority will be seen in operation. Exhibits will include trucks, cranes, overhead and belt conveyors, power units, controls and all other accessories.

At the Convention, 12 papers are to be read. They cover such subjects as work study, mobile cranes, the economics of industrial trucks, and electronics. There will also be an open forum at which relevant questions will be answered by a team of experts. This exhibition and convention is organised by *Mechanical Handling*.

Britain Must Try Even Harder states O.E.E.C. Report

A SURVEY of Britain's economic progress during 1953 has been compiled by O.E.E.C. and was released in Paris on 30 Dec. At the time of going to press the full report had only just been made available in this country due to hold-ups on the continent, but the main conclusion reached was that the U.K.'s basic problem is to increase her exports substantially. An even more familiar piece of advice is that the increase should apply particularly to countries outside the sterling area. The report contains a mild rebuff at the decline in our overseas trade although it admits the increased burden of an intensified defence programme. Britain is advised to base her economic policy on increased exports, of industrial fixed investment, and savings to match both.

The report might have been kinder if it had been possible at this stage to assess the results of Mr Butler's incentive budget last April. The advisability of reducing income tax is queried on the grounds that it might increase demand for consumer goods at home, which, in turn, might reduce incentives to export. If this should prove correct it would not augur well for further reductions in either income tax or purchase tax next budget day. Further criticism of our efforts is found in a table which shows how Britain's rise in industrial production since 1950 lags behind that of other O.E.E.C. countries.

Wage claims are prevalent at present, and a number affect the electrical industry. On this subject the O.E.E.C. survey comments that if the claims are granted, not only would the consequent increase of costs hamper exports, but there might also be additional consumption.

Issued at the same time as the above, were surveys of Germany and Italy.

OFFICIAL PUBLICATIONS

COAL MINES.—Ministry of Fuel and Power regulations and orders relating to safety and health. H.M.S.O. 4s.

DEFENCE SPECIFICATION.—D.E.F. 14. Radio Frequency Cables. Revision of GDES 23 standardising sizes and impedances. H.M.S.O. 7s. 6d.

B.E.A. BORROWINGS.—Treasury Statement of Guarantee on B.E.A. loans (see page 32). H.M.S.O. 2d.

BRITISH STANDARDS.—B.S.308: Engineering Drawing Practice (Revision); B.S.784: Methods of Test for Chemical Stoneware; B.S.2057: Patients' Trolleys (Tilting Top).

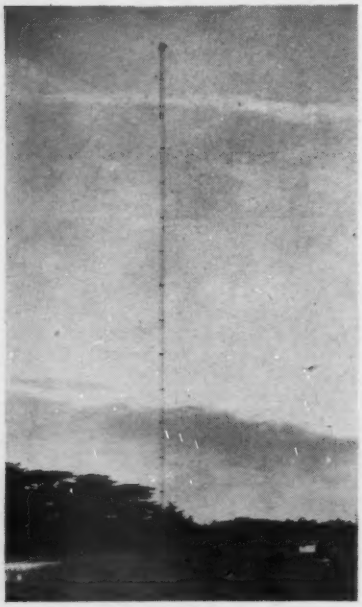
E.R.A. REPORTS.—A/T130: Detection of Very Small Amounts of Iron in Electrolytic Copper, by P. Armes, 3s. 3d.; G/T282: Intrinsically Safe Electrical Apparatus: Relation of Igniting Current to Circuit Inductance for Inflammable Mixtures of Calor Gas (Butane) and of Cyclohexane with Air, by E. M. Guenault, E. Atherton and F. Shaw, 6s. 3d.; M/T123: Radio Interference from Motor Vehicles: Comparison of British and German Measuring Equipment, by A. H. Ball and S. F. Pearce, 10s. 9d.; V/T110: Corrosion of Buried Copper and Ferrous Strip in Natural and Salted Soils, 10s. 10d.

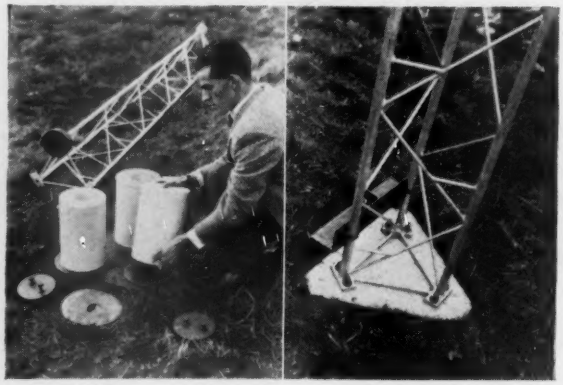
ECONOMIC CONDITIONS IN U.K. O.E.E.C. Survey of 1953. Available from H.M.S.O. 2s. (See this page.)

Testing 150 ft Lightweight Welded Radio Masts

A SERIES of torsion, wind loading and electrical tests were carried out recently on 150 ft light-weight welded radio masts by the makers, British Insulated Callender's Construction Co., Ltd. Two masts were required by Decca Navigator Co., Ltd., for survey work in the Sahara Desert, and in view of the urgency it was decided to carry out field trials. B.I.C.C. have been supplying 120 ft masts of this kind for a number of years, and, assembled from 10 ft sections, they can withstand wind at 100 m.p.h. and head loads of 1,000 lb at maximum height. Often, however, it is impossible to control stay tensions during erection to comply with design requirements. Allowances have to be made and the measurement of strength can only be ascertained by tests.

For the torsion tests a horizontal member was bolted to the head of a mast, projecting about 3 ft either side. A load was applied at right angles to one end, and deflection measured against applied load. Two head stays were used in each of three directions, with a small couple arm between them. With a torque of 450 lb ft rotation degrees measured 3 and with 1,800 lb ft measurement was 8. The test was repeated with single stays. Wind force was reproduced by loading between the two masts. With a head load of 1,000 lb deflection was 7·2 in. and with 1,600 lb it was 11·5 in. For electrical tests, one mast had three post insulators. Lead packers were placed above and below these insulators, and glass rod insulators inserted in all stays. The tests were carried out at the headquarters of the British Telecommunications Research Ltd.





One of the two masts tested by B.I.C.C. at Taplow Court is on left completely constructed. On the right post insulators are being placed in position before erection of the second mast and before electrical tests. On the extreme right is the base of one mast standing on a dished base-plate

Although trams are a very familiar sight in most of the state capitals of Australia, they have become a thing of the past in Launceston, Tasmania. Except for a few outlying diesel bus routes, trolley buses are now the only mode of transport in Launceston. One of the 30 trolley buses with electrical equipment provided by the General Electric Co. and a B.U.T. chassis is illustrated here

CHESTER'S SCHOOLS TO BE CONVERTED TO 110 V

IT is reported from Chester that the Corporation's Education Committee proposes to invite tenders for the conversion of electricity supplies from 230 V to 110 V to all primary and secondary schools under their jurisdiction. Although this will not involve the complete rewiring of all schools in the district, the decision is nevertheless a major one. The matter arises from a recommendation placed before the Council by the education committee just over a month ago, urging that the 230 V supply to Overleigh school, officially opened in mid-November, should be converted to a 110 V supply. Cost of conversion was estimated at that time to be £550. Reason for this recommendation was that with a 230 V supply school children faced the possibility of being electrocuted.

It was pointed out that the suggestion was made originally by a Government official, and it was this fact that led a member of the Council to assert that they would be in a very difficult position if there was a fatal accident. The Ministry of Education have stated that it is extremely unlikely that any of their officials recommended the conversion to 110 V, and denied that any direction on the subject had been issued. An enquiry had been received from Chester concerning Overleigh school, a Ministry official confirmed. A few similar enquiries had been made in the past, and in all cases the Ministry had replied to the effect that any such conversion of electricity supplies was entirely a matter for the local authority. The number of these applications was said to be almost negligible. The Ministry asserted that to date they had had no reports at all of electrical accidents to children at schools on 230 V.

Sayings OF THE WEEK

"Unlike the other nationalised industries, the North of Scotland Hydro-Electric Board was not subject to over-decentralisation and all kinds of dictation. The Board defined its policy to the best advantage of the community it served." . . . SIR HUGH MACKENZIE, deputy chairman of the N. of Scotland H.E. Board, speaking at Inverness after a tour of construction work.

"It is a fairly well known fact that an electric lamp burning with the brass cap downwards does not usually have as good a life as a lamp bulb suspended in the normal manner." . . . MR H. PAYN, Boston district manager for the East Midlands Electricity Board, in a letter to the Woodhall Spa U.D.C.

"The provision of electricity to the rural areas was now so costly as to make it a virtually impossible proposition to many farms. In the opinion of the committee that this position was entirely due to the fact that the electricity authorities had misconstrued the wording of the 1937 *Act to mean that each Area Board should deal with the finances of its rural electrification separately from the resources of the Authority as a whole."* . . . MR C. J. BARNETT, chairman of Electricity Committee of Blackawton Parish Council.

Electrical Development Association's journey into space at the current Schoolboys Own Exhibition at the Horticultural Halls, Westminister, is proving overwhelmingly popular. Boys here are being fitted out with special space-suits and "bridged" for their trip through time and space

EDINBURGH'S TRAMS REPLACED BY 1956

THE era of trams in Britain is rapidly coming to an end. Broadly speaking, it is found that motor buses are a more economic proposition and they are replacing the tram in nearly every city. Latest news of the conversion programme comes from Edinburgh where the first phase of the changeover—the 25% authorised in 1951 has now been completed. This year's programme begins to implement the decision to scrap all the trams and by December next half the electric vehicles will be out of service. During 1954 100 trams will be replaced by the same number of buses and 12 miles of track discarded. More progress will be made in 1955 and the whole conversion should be completed in the following year.

NEWS IN BRIEF

The caption to our illustration last week of Denis Ferranti Co., Ltd.'s three transformers en route for Canada mentioned the company's works at Royston. This should, of course, have read Royton.

We gratefully acknowledge receipt of a desk calendar from Nalder Bros. and Thompson Ltd., and others from Bailey Meters and Controls Ltd., featuring Staythorpe power station, Panelec (Great Britain) Ltd., again illustrating some of their installations, and Edison Swan Electric Co.

Selling prices for tungsten ores of standard 65% grade and ordinary quality have been reduced again. Wolframite is now 165s. and Scheelite 150s. per long ton unit delivered consumers works.

COMPANY ACTIVITIES

FROM London's Kingsway where all the big electrical equipment people live went up a huge sigh of relief on New Year's Eve, the last day for most companies for liability to Excess Profits Levy. This 6s. in the £ impost intended to stop excessive profit on re-armament orders, has been applied to all and sundry, because of the impossibility of segregating orders for the Defence programme from normal business. In the event, even excess profits made on the export drive and other meritorious efforts have had to bear their share.

TV and radio set and equipment manufacturers will greatly benefit. In some cases the saving will equal as much as a year's dividend.

The big electrical engineering and cable makers will save large sums too. Take the giant Associated Electrical with an Ordinary capital of nearly £18,000,000. Its last payment of E.P.L. was £1,052,506. This group's earnings, allowing for the subsequent bonus issue, were equal to 42·8%. Cutting out E.P.L. would mean extra earnings on the ordinary capital of 10·8% grossed up at 9s. in the £.

But it should also be noted that the additional gross percentage earnings represented by E.P.L. would of course be subject to distributed profits tax (now 20%) if distributed.

English Electric will be another considerable beneficiary. Its last payment of E.P.L. was £505,500. And earnings based on the current capital of £10,616,000 were 31%. Additional earnings "released" by the dropping of E.P.L. will be 8·6%. In the case of International Combustion, the saving will be £190,000 on a capital of £1,918,000. Last earnings were 43% and additional earnings would be 18% on the same basis.

The year 1953 was a difficult one for the cable-making industry, largely due to the effects of the change over from a controlled copper market to free dealings.

That had been anticipated during the early part of the year, and from then until August, buyers of goods containing copper acted extremely cautiously in anticipation of a fall in raw material prices. Also in the same month, new British standard specifications for rubber cables were introduced which were also expected to reduce the cost of manufacture and that deterred sales further.

Both home and export business was affected and there was also stiffer competition from Germany and Japan.

General Cable Manufacturing Co. out at Leatherhead, although the largest of the independents, is small as cable companies go. Its results for the year to September last show a decline in trading profits from £146,077 to £119,288, and the net profit, after tax, from £54,120 to £45,988. That represents a decline of about 20%.

The full accounts of the Westinghouse Brake and Signal Co. for the year to 26 Sept. last show an extremely liquid financial position. Free reserves of £3,800,000 are more than twice the issued capital. The group as a whole, says Mr A. R. S. Nutting, the chairman has "made very substantial progress during the year." The tax provision for the year is £763,000 included in which is an E.P.L. assessment of £103,000.

Mr Nutting has further added that the current year "should prove to be satisfactory in every way."—*From our City Correspondent.*

Year to Jul. 31	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	38,300	11,991	44	20	4/6	3/6
1950	30,560	10,852	39	20	4/4	3/9
1951	39,196	10,483	40	20	4/6	3/6
1952	51,689	11,252	43	25	3/9	2/6
1953	58,745	14,057	51	25	5/7	3/3

General Cable Manufacturing Co.

The reduction in profit (which we noted on December 17) was due to exceptionally difficult trading conditions encountered during the second half of the year, Mr C. W. R. Pantlin, the chairman, stated at this meeting last Thursday. The difficulties arose through circumstances beyond the company's control, he added. In the first place it was generally anticipated that the price of copper would fall heavily on the resumption of a free market, on 5 Aug., and as that date was known well in advance cable sales for several months before hand were on a greatly reduced scale and turnover suffered to a considerable extent. A contributory cause of the recession in trade was the knowledge that revised British Standard Specifications for rubber cables, which it was understood would reduce the cost of manufacture, were to be introduced on August 1, and reductions in selling prices were in fact made on that date. In the event, however, these had been partly anticipated for a considerable period before 1 Aug., with the result that general business was restricted even more severely than it might otherwise have been during that period. Fortunately the full impact of these events on the year's results was partially offset by the steady progress which had been made in extending the scope of the company's business in the industrial and specialised fields which the ever-expanding uses of electricity are creating in this country and abroad, he went on. The general belief that the present price of copper is still too high continues to exercise a restraining influence on trade.

Parnall (Yate) Ltd.

This company has now purchased the whole of the share capital of Ewart and Son, Ltd., the gas-fired water heater firm. It already directly controls Ascot Gas Water Heater.

Thos. Barlow and Sons

This South African firm of electrical and mechanical engineers reports a consolidated net profit of £327,923, compared with £388,529 for the previous year. The dividend is again 2s. 6d.

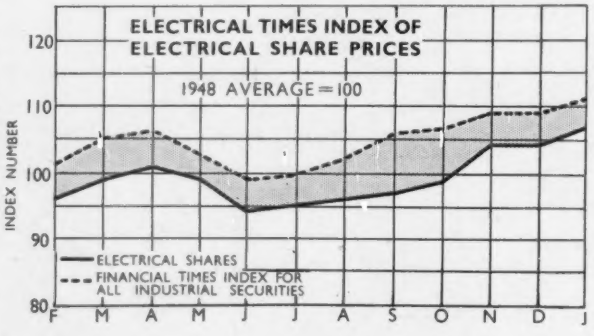
Frederick Braby and Co.

Consent of the Capital Issues Committee having been received, the directors have decided to create £400,000 5% Debenture Stock, ranking *pari passu* as regards security with the existing £600,000 5½% Debenture Stock. The new stock is to be placed with holders of the present stock.

British Electric Resistance Co.

The increase in trading profit continued during the past year, as will be seen from our accompanying table. Mr H. Paul-Huhne, the chairman, states that the demand for the resistance products manufactured by the parent company for the home market was maintained throughout the year, and despite the ban on imports by certain Commonwealth countries, total sales were above the previous year's figures. Although the present order book will keep the plant occupied for several months to come, there are signs of increasing competition and a serious falling off in demand both at home and abroad, he adds.

During December share prices continued the upward trend which began as long ago as last June. Both indices rose over two points. The 'Financial Times' index for all industrial shares at the year's end stood at 111.3 an increase of 2.2, whilst the 'Electrical Times' index rose by 2.4 to 106.9.



ELECTRIC SUPPLY NEWS

Boldon (Co. Durham)

THE Urban Council has approved plans by the North-Eastern Electricity Board for the laying of a 22 kV underground cable to provide a power supply to 529 houses and other premises at West Simonside.

Brighton

WORK is shortly to commence on the £1,750,000 improvement scheme for Shoreham Harbour which is being undertaken in conjunction with the B.E.A. The scheme will allow the entrance of 4,000 ton colliers instead of the present 1,500 ton limit for vessels, to provide coal for the Authority's Brighton power stations. It involves lengthening the breakwater to 500 ft, widening the entrance from 176 ft to 450 ft, and deepening the harbour by five or six feet. The new harbour is expected to save B.E.A. about £250,000 a year on the quicker turn round of colliers. The Authority are bearing the financial burden of these improvements for the Harbour Trustees have established the principle that the harbour's financial position should not suffer by the scheme.

East Midlands

UP to the month of October last, sales of electricity by the East Midlands Electricity Board increased by approximately 10% over the corresponding period last year, Mr C. R. King, chairman of the Board, told members of the Consultative Council last week. But the rate of increase for the month of November fell to 0·9% compared with November 1952. In his opinion the Board's optimistic forecast of sales during 1953/54 was, therefore, now unlikely to be realised.

Eire

THE Electricity Supply Board is shortly to introduce a new domestic tariff. At present charges to householders are based on the rateable value of the house, but the new tariff will be based on the number of rooms, while the unit charge will remain unchanged. Announcing this, the Board state that because of certain inequalities which developed in the present rates of charges, the desirability of a change had been under investigation for some time. To assist in the investigation returns were obtained from about 250,000 domestic consumers. The new tariffs will be available to domestic consumers except those connected under the Rural Electrification Scheme.

Erith

THE B.E.A.'s proposal to erect a new generating station at Erith was the subject of a public inquiry held locally a few days ago. Opposition to the plan was made by Belvedere residents, on whose behalf a petition was submitted, and industrial concerns. Outlining the case for the B.E.A., Mr H. J. Willis, Q.C., said that the claim was part of the Authority's continuous programme of development and expansion. They had submitted the Thames Estuary as an ideal place for the additional capacity to meet the demands of London and South East England. As planned, the station would have an ultimate capacity of 240 MW made up of four 60 MW generators, each with a 550 klb/hr boiler.

Lanark

SHOULD houses in new estates of the Lanark County Council be all-electric or have both electric and gas services installed? That problem is to be discussed by the County Council, probably at next month's meeting, when a policy decision may be made. The Housing (Executive) sub-committee is shortly to present its report on the subject. The matter has arisen over houses at the Napier Square site, New Stevenston. In the first development of 84 houses, it had been intended to install electricity for lighting, and gas for cookers and washboilers. The South-West Scotland Electricity Board, however, indicated that they were "disturbed" at the estimated low revenue they would receive compared with the estimated high capital cost incurred. The Board explained that the capital cost of providing supplies to housing schemes was generally £47 per house, but that for this first development at New Stevenston the cost would be £141 per house. When the scheme was fully developed—280 houses—the cost of supplying electricity would be £70 per house. To avoid delay in the production of the houses, the Board has agreed to install electricity for lighting only in the first 84 houses at New Stevenston, but they have asked the County Council to review their present policy and consider the introduction of electric cookers in houses in future schemes.

Lanarkshire

NOW that the National Coal Board is taking a bulk supply from the South West Scotland Electricity Board at Shotts for its collieries and workshops, the N.C.B. generating station there has been shut down.

Midlands

MORE than a quarter of a million pounds is expected to be spent on rural electrification in the Midlands Electricity Board's Worcester and district sub-area during the current financial year. In a report just issued it is stated that despite restrictions on capital expenditure which have limited the speed of the Board's programme, there are now 14,161 farms on supply in the Board's area as a whole, compared with about 8,000 on vesting day in 1948. It is estimated that there are altogether in the sub-area 4,714 farms or agricultural premises. By 1 July last year the total farms on supply had increased to 3,327 leaving only 811 to be connected.

Worcestershire

AFTER taking expert advice the Planning Committee of the Worcestershire County Council has now come to the conclusion that it cannot object in principle to the proposed 275 kV overhead line from Melksham to Hams Hall, Evesham Rural District Council has been told. A written statement on behalf of the County Council is to be handed in at the public inquiry to be held later this month. The point of argument is the route the new line shall take, and the authority most seriously concerned is Gloucestershire County Council because the line is proposed to cross the Cotswolds. The County Council has consulted three engineers, and it would appear that it could not object to a scheme on which there had been "a national decision." Originally it had been suggested that as the views of the Evesham Rural District Council's Planning Committee coincided with those of the County Council a joint case might well be submitted by the latter authority to the inquiry.

Windsor

A DEMAND of the Southern Electricity Board for a guaranteed revenue of £780 per annum for five years for laying electricity mains to the Newton Court site was described as "blackmail" at a meeting of the Windsor Rural District Council. The matter is to be referred to the Ministry of Housing and Local Government and the local M.P.

LIGHTING SCHEMES

Bedford.—Lighting in part of Clapham Road is to be improved by the T.C., at a cost of £1,790.

Boldon (Co. Durham).—The Highways Committee has called for a scheme of revised public lighting in East and West Boldon, Whitburn and Cleadon.

Brigg.—The U.D.C. is shortly to consider estimates for a proposed trunk lighting scheme through the town.

Darlington.—The Streets Committee has asked for a scheme to be prepared to decide future replacement policy for improved street lighting generally in the town.

Esher.—The Highways Committee has recommended acceptance of a scheme to improve street lighting in the town over a number of years.

Hendon.—The Council has approved a ten-year scheme to complete the improved street lighting in the Borough, at a cost of £31,000.

Litherland.—M.o.T. has approved the Council's street lighting proposals, which are estimated to cost £1,300.

Redcar.—The Finance and General Purposes Committee has approved a scheme for electric lighting along Coatham Road, at a cost of £3,150.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders, unless otherwise stated.

9 Jan.—Swansea T.C. Installation in Clase primary school. Applications by above date.—Advertised in 31 Dec. issue.

11 Jan.—Aberdare U.D.C. Lighting equipment at Hirwaun Rd, and Victoria Sq.—Advertised in 17 Dec. issue.

11 Jan.—N. Ireland. Installation at Waveney Hospital.—See 24 Dec. issue.

12 Jan.—Lanarkshire. Electrical installation in Protestant and R.C. primary schools at Kirkwood, Coatbridge. Applications by above date to W. C. Brownlie, County Clerk, Lanarkshire House, 191 Ingram St, Glasgow.

12 Jan.—Paignton U.D.C. Supply of (SD 100) 117 class A concrete street lighting columns and brackets; (SD 101) erection of 117 columns, brackets and lanterns; (SD 102) supply of brackets and sockets for steel poles; (SD 103) supply of lanterns for 400 W, 125 W and 80 W mercury lamps, 140 W and 60 W sodium lamps; (SD 104) supply of control equipment for above; (SD 105) supply of strap-on and socket boxes for control equipment. Engineer and Surveyor, Municipal Offices, Oldway, Paignton.

12 Jan.—Stoke-on-Trent T.C. Street lighting at Hanley and Burslem.—See 31 Dec. issue.

13 Jan.—Bradford T.C. Electrical installation in 238 houses and 12 flats on Halifax Rd site, and 12 bungalows on Buttershaw site. City Engineer and Surveyor, Town Hall. Deposit £2 2s.

13 Jan.—Scotland. Installation of electricity at police station at Kennethmont. County Architect's Dept, 25 Union Terrace, Aberdeen.

14 Jan.—Co. Down. Installation in school meals centre at Donaghadee.—See 24 Dec. issue.

15 Jan.—Burntisland T.C. Street lighting.—See 31 Dec. issue.

15 Jan.—Lerwick (Scotland). Installation in school at Bell's Brae.—See 10 Dec. issue.

15 Jan.—Sheffield T.C. Installation at Manor Community Centre.—See 24 Dec. issue.

16 Jan.—Plymouth T.C. Supply of power cables.—Advertised in 31 Dec. issue.

18 Jan.—Angus. Centralisation of heating and hot water services at Stracathro Hospital. Apply by above date.—See 31 Dec. issue.

18 Jan.—Coseley U.D.C. Supply, erection, etc., of 226 140 W sodium lighting units on catenary wires from steel poles along part of Birmingham trunk rd, approx. 3,425 yds. P. J. Stanton, Engineer and Surveyor, Bayer Hall, Coseley. Deposit £2 2s.

18 Jan.—Birkenhead T.C. Lamps and cables during year ending 31 Mar., 1955.—See 31 Dec. issue.

18 Jan.—Eston (Yorks) U.D.C. Street lighting equipment.—See 31 Dec. issue.

18 Jan.—Market Harborough U.D.C. Overhead lines and underground cable in waterworks extension.—Advertised in 10 Dec. issue.

20 Jan.—N. Ireland. Electrical requirements for Tyrone and Fermanagh Hospital Management Committee, for year beginning 1 April. Secretary, Tyrone and Fermanagh Hospital, Omagh.

20 Jan.—Fareham (Hants) U.D.C. Fittings and lamps during 1954-55.—See 24 Dec. issue.

20 Jan.—Lutterworth R.D.C. Wiring, etc., in 100 houses.—See 31 Dec. issue.

20 Jan.—N. Ireland. Electric Equipment for N. Antrim Hospital Management Committee.—See 31 Dec. issue.

21 Jan.—Plymouth T.C. Supply of lamps wanted during year beginning 1 April. Stores Officer, Municipal Offices, Athenaeum Place, Lockyer St.

22 Jan.—Edinburgh T.C. Installation in 32 houses, and five shops at Canongate.—See 17 Dec. issue.

23 Jan.—Manchester T.C. Supply of switches and cable material required by Transport Committee. Details from General Manager, Corpn. Transport Dept., 55 Piccadilly.

25 Jan.—Cockenzie and Port Seton T.C. Installation of sodium street lighting. Burgh Surveyor, Council Chambers, Port Seton.

25 Jan.—Westminster T.C. Supply of electric lamps for year beginning 1 April. Applications to Town Clerk, Westminster City Hall, W.C.2.

25 Jan.—St. Neots U.D.C. Vertical unchokeable sewage pumps.—See 17 Dec. issue.

26 Jan.—Bath T.C. Electrical installation in first block of dwellings at Snow Hill, Snailum, Huggins and Le Fevre, architects, 18 Brock St. Depost £1 1s.

26 Jan.—Roxburgh. Electrical installation in nurses' house and 4 old persons' houses at Bonchester Bridge. County Architect, County Offices, Newtown St, Boswells.

27 Jan.—Stamford (Lincs) T.C. Street lighting.—See 10 Dec. issue.

29 Jan.—Belfast T.C. Elect. Dept. requires supplies of various electrical equipment. Forms (No. 31) from Dept. at East Bridge St. Fee 10s.—Advertised in this issue.

29 Jan.—Salford T.C. Thermal storage calorifier, centrifugal boiler feed pump, etc., at Blackfriars Public Baths.—See 24 Dec. issue.

30 Jan.—Hendon T.C. Supply of 25 ft concrete columns, and supply and installation of lanterns for 140 W sodium lamps, with transformers, condensers, etc., and wiring, for street lighting along Hendon Way and Watford Way. Applications by 16 Jan. to Borough Engineer and Surveyor, Town Hall, N.W.4. Deposit £2 2s.—Advertised in this issue.

30 Jan.—Prestwich T.C. Supply of lamps and other electrical equipment for year ending 31 Mar., 1955. Borough Engineer, Town Hall.

1 Feb.—N. Cotswold (Glos.) R.D.C. Pumps and auxiliary equipment and other works at Moreton-in-Marsh pumping station.—See 24 Dec. issue.

3 Feb.—Donegal. Installation in District Hospital at Dungloe.—See 24 Dec. issue.

5 Mar.—Belfast T.C. Seven 220,000 lb/hr stoker fired boiler units and other plant for power station West.—Advertised in 31 Dec. issue.

5 Feb.—Dalkeith T.C. Electrical installation in 74 houses at Woodburn. Architect, R. J. Naismith, 44 Queen St, Edinburgh.

5 Mar.—Belfast T.C. Supply and erection of (*a*) two 60,000 kW C.M.R. turbo-alternator, feed heating and condensing plant sets (Form N.1277); and (b) high pressure steam, feed, drain and exhaust piping, steam receivers and associated valves, electrical controls, fittings, etc. (Form N.1380). Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. each case.—Advertised in this issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 94 Queries answered this week

"Eastman" cloth cutting machines, makers of? H.T.G.—Eastman and Textile Machines Co., Ltd., 15 City Rd, E.C.1.

Western Clock Co., Illinois, U.S.A., address for? L.E.B.—Westclox Ltd., Strathleven, Dumbarton, Scotland.

"Lectross" towel rail, address for spares? M.B.E.— E.P.E. Ltd., 152/3 Fleet St, London E.C.4.

"Denver" commercial hair dryer, E.M.E.B., repairers of?—Osborne Garrett and Co., Ltd., 51 Frith St., W.1.

Flameproof bunghole inspection lamps, makers of? D.R.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2. Watts Fincham (1932) Ltd., 9 St Helens Pl, E.C.3.

Domestic size coffee grinders, suppliers of? L.E.B.—Zachariah Parkes Ltd., 47/48 Hampton St, Birmingham 19. Fairfax Eng. Ltd., 1 Regency Parade, Finchley Rd, N.W.3.

"Reliance" surgical instrument steriliser, makers of? K.H.T.— Rosebery Metal Works Co., 149/153 Rosebery Ave, London E.C.1.

No date stated.—Hertfordshire. Applications invited for inclusion on list of contractors.—See 31 Dec. issue.

No date stated.—N. of Scotland Board. Lighting, heating and auxiliary cabling installation at Luichart Dam. Merz and McLellan, 72a George St., Edinburgh. Deposit £1. 1s.—Advertised in this issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobolds Road, W.C.1, quoting reference.*

4 Feb.—Australia. Tenders (C. 7024) invited for supply of a number of motor generator sets to various specifications for Posts and Telegraphs Department, Melbourne. Documents from Chief Supply Officer (Room 406), Australia Hse, Strand, London, W.C.2.

9 Feb.—Australia. Department of Posts and Telegraphs, Melbourne, requires supply of power rectifiers to various specifications (C. 7020). Documents available from Chief Supply Officer (Room 406), Australia Hse, Strand, London, W.C.2.

17 Feb.—New Zealand. Tenders (P and T 150/6667) invited for supply of 86,300 capicitors and 200 condensers to various specifications. Director-General (Stores Div.), G.P.O. Wellington. B.o.T. (Ref: ESB 12497/53).*

6 April—Uruguay. Supply of vehicle specially equipped to detect faults in underground cables—3-phase, a.c., 50 c/s of 220 V, 6,300 V and 31,500 V. Max. length of these cables is 7,300 metres. (No. 3945/54.) Administracion General de las Usinas Electricas y los Telephonos del Estado. B.o.T. (Ref: ESB 12690/53).*

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 5 January.

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	231	−3	285
,, (3 months)	219⅝	−2	—
LEAD, refined pig, min. 99·97% purity (cash)	89½	−¼	100½
,, (3 months)	88½	−¼	—
TIN, refined, min. 99·75% purity (settlement)	662½	+12½	946
,, (3 months)	637½	+3½	938½
ALUMINIUM, ingots 99·99·5%	156	−6	166
ZINC, virgin, min. 98% purity (cash)	75½	+½	89½
,, (3 months)	74	+½	—
RUBBER No. 1, RSS. spot (per lb.)	17½d.	−⅛d.	26⅛d.
,, c.i.f. basis, ports. Feb. (per lb.)	17d.	−⅛d.	25⅜d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	51	+£1	53
Mild Steel Tape (0·014 in.)	40	—	39½

New Companies

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London, W.C.2.

Transistor Development Co., Ltd., Montagu House, Sussex St, Cambridge. Manufacturers of and dealers in germanium diodes, transistors and like devices and electronic mechanical devices, etc. Cap.: £100. Dirs.: not named. Subs.: J. A. Cowell and W. A. J. Marker.

Stradlings Electrical (London) Ltd., 40a The Broadway, Northwood Hills, Middx. Manufacturers of and dealers in electrical apparatus, radio and television apparatus, etc. Cap.: £100. Dirs.: W. E. Jones and Edith M. Jones.

Beeneys Ltd., 20 College Rd, Chilwell, Nottingham. Motor aeronautical, electrical and mechanical engineers, etc. Cap.: £2,000. Dirs.: to be appointed by subs. Subs.: A. M. Phillipson, 20 College Rd, Chilwell, Nottingham; and C. H. Wagstaff, 1 Hounds Gate, Nottingham.

J. Edward Hall (Electrical Engineers) Ltd., Clarence Rd Works, Leeds 10. Cap.: £20,000. Dirs.: W. Triffitt, J. E. Hall, and J. H. Hyde.

John A. Wilson & Co., Ltd., 53/9, Gt. George St, Liverpool. To take over business of electrical and mechanical engineer carried on at Liverpool by John A. Wilson. Cap.: £2,000. Dirs.: J. A. Wilson; and Marjorie C. Wilson.

Klee's Ltd., 566 Stratford Rd, Sparkhill, Birmingham. Industrial, commercial, wholesale and retail electricians, electrical contractors, radio and television engineers, etc. Cap.: £100. Dirs.: G. R. T. Klee and B. J. Freeman.

Gazette Announcements

COMPANIES ACTS

Fildews (Exmouth) Ltd. Creditors have appointed Geoffrey Collins Ehlers, C.A., 28 Baldwin St., Bristol, as liquidator.

Voluntary Liquidation

Electronic Services (Westerham) Ltd. Creditors required to send names and particulars to F. Goodman, cert. acc., 3 Broad St Buildings, Liverpool St, E.C.2, liquidator, by 21 Jan.

Edward Wolf and Son Ltd., electrical engineers. At statutory meeting of creditors statement of affairs disclosed liabilities £7,516 of which £4,595 was due to unsecured creditors; £1,600 to Bank; £44 in respect of preferential claims; and £1,275 loans. Assets of book value of £3,276 were estimated to produce £2,442, showing deficiency of £5,073. Issued share capital amounted to £502 and, so far as the shareholders were concerned, there was total deficiency of £5,575. Resolution passed confirming voluntary liquidation with Mr N. W. Osborne, C.A., of 11/12 Finsbury Sq., E.C.2, as liquidator, with committee of inspection.

A. W. Marsh Ltd., electrical contractors. At meeting of creditors statement of affairs showed liabilities £7,235, of which £7,064 was due to unsecured creditors, and £170 to partly secured creditor. Assets of book value of £852 estimated to realise £280 and after allowing £154 for preferential claims there were net assets of £125, or deficiency of £7,110. Resolutions passed confirming voluntary liquidation with Mr David Morgan, of Morgan and Co., 100 Park St, W.1, as liquidator, with committee of inspection.

BANKRUPTCY ACTS

Receiving Order

Harrogate. Norman Lusher, electrician, now of 18b Oxford St, Harrogate. Date of receiving order, 21 Dec.

Dividends

Wolverhampton, Joseph H. Bourne, trading as Amplifier Illumination Co., and in partnership as E. Desborough and Sons, both at Rayleigh Works, Powlett St, Wolverhampton. Supplemental dividends of 1¼d. in £ payable at Official Receiver's Office, Somerset House, 37 Temple St, Birmingham, on 14 Jan.

Newcastle-on-Tyne. May Tilley, trading with George W. Tilley as electrical and radio wholesaler at 13 Shakespeare St., Newcastle. First and final dividends of 2s. 1½d. in £ payable on Jan. 15 at Official Receiver's Office, Clarendon House, Clayton St. West, Newcastle.

Appointment of Trustee

St. Albans. Allan J. Coles, electrical engineer and contractor, trading at 2a Pinner Rd., Harrow. First and final dividends of 7s. 2d. in £ payable tomorrow (Fri.) at Official Rerceiver's Office, 58-61 York Ter, Regent's Park, N.W.1.

Tunbridge Wells. John L. R. Mack, electrical engineer, trading at 5 Priory Rd, Tonbridge. Trustee is J. S. Bradley-Hore, Cert. Acc., 7 Old Steine, Brighton.

Contracts Placed

B.E.A. One 540,000 lb/hr boiler at Barking C, Babcock and Wilcox Ltd.; High pressure steam and feed pipework and valves at Marchwood, John Thompson Water Tube Boilers, Ltd.; Two 36 MVA generator transformers at E. Yelland, C. A. Parsons and Co., Ltd.; Four booster and four boiler feed pumps at Willington, Mather and Platt Ltd.; Four 120,000 lb/hr boilers at Lincoln, Richardsons Westgarth and Co., Ltd., and two 20,000 kW turbo-generators condensing and feed heating plant at same, Brush Electrical Engineering Co., Ltd.; One 72 MVA generator transformer at Meaford B, British Thomson-Houston Co., Ltd.; Two 760,000 lb/hr boilers at Ferrybridge, Stirling Boiler Co., Ltd.; Three 180,000 lb/hr boilers at Mexborough, Richardsons Westgarth and Co., Ltd., and Condensing and feed heating plants for two 30,000 kW turbo-generators at same, English Electric Co.

Trade Notes

Change of Address. The Glasgow district office of the Edison Swan Electric Co., Ltd., has moved to new premises at 167 St. Vincent St, Glasgow. The telephone number remains Central 0687/9. All departments, including the cathode ray service depot (new telephone number, Central 2206), now operate, from that address.

Aluminium Price. The price of virgin ingot aluminium was increased from £150 to £156 a ton with effect from 1 Jan., 1954.

BUSINESS PROSPECTS

Home

Airdrie. Erection of school off Dunrobin Rd has been approved.

Bacup (Lancs) T.C. Plans approved for erection of 165 houses on Tunstead Rd estate.

Barkingside (Essex). New factory and offices proposed by Kelvin and Hughes Ltd. Architects are T. P. Bennett and Son, 43 Bloomsbury Sq, W.C.1.

Basingstoke (Hants). Airpak Ltd. are to build factory and offices at Overton. County planning permission obtained.

Carlisle. Cavaghan and Gray Ltd. planning bacon factory in London Rd.

Doncaster. B. A. Miller, 66 Rodney St, Liverpool, is architect for new church at Wheatley Hills. Estimated cost, £15,000.

Durham T.C. Application to be made to borrow £14,400 for erection of shops and flats in Sunderland Rd.

Ebbw Vale (Mon). Richard Thomas and Baldwins Ltd. have approved development of welfare amenities at their works. Plans include existing club and institute, new canteen, concert hall and youth club. Estimated cost £110,000.

Eccles. Moorfield Engineering Co., Ltd., are planning to build two-storey building in Liverpool Rd.

Fleet (Hants). Planning permission granted for erection of factory and offices in Albert St for County Commercial Cars Ltd.

Hartlepool. Extensions costing £150,000 to be carried out at Pallister works for Steetley Co.

Huddersfield T.C. Erection of primary school at Bradley. Borough Architect's Office, High St. Buildings.

Keynsham U.D.C. Erection of 94 houses on Park West estate. Engineer and Surveyor, Council Offices, Keynsham, Bristol.

Maltby (Yorks) U.D.C. Erection of 50 houses on Cliff Hill estate. Architect and Surveyor, Council Offices, Rotherham Rd.

Maryport. Tenders to be obtained by West Cumberland Industrial Development Co., Ltd., 30 Rope St, Whitehaven, for factory extensions for Cumberland Childwear Ltd., on Solway estate.

Nantwich (Ches). Manchester Hospital Board has approved in principle improvements to electrical installation at Barony Hospital. Working drawings to be prepared.

Newcastle-on-Tyne. Factory alterations proposed in Benton Rd. for Pepsi-Cola (Novo Bottlers) Ltd. Plans by R. H. Gallannaugh, 12 Grafton St, London, W.1.

Newcastle-on-Tyne T.C. Some £3,630 to be spent on installation of h.t. equipment at new workshops of Rutherford College of Technology. Gregory and Partners, Pilgrim House, Newcastle, are consultants.

Northumberland. Final plans approved for proposed Killingworth Grammar School. Total cost will be about £141,000.

Seaton Valley U.D.C. Scheme to be prepared for installing electricity in houses at Seghill.

Stanley (Dur) U.D.C. Tenders to be invited for erection of about 65 houses at Cathgate.

Stoke-on-Trent T.C. Application to borrow £1,790 to be made for rewiring Penkhull Children's Homes.

Sutton-in-Ashfield (Notts) U.D.C. Sixty-four houses to be built on Corsic Lane scheme No. 6, at estimated cost of £88,950.

Wallsend. Engineering laboratory and offices in Stephenson St. proposed for Commercial Plastics Ltd. Architect is W. Stockdale, 73 Howard St, North Shields.

Warrington. Factory extensions being planned in Scotland Rd by Peter Stubs Ltd., in Lythgoes Lane by Stotherts Ltd., and in Hawthorne St by J. Tennant and Sons (Warrington) Ltd.

Wath-on-Dearne U.D.C. Erection of 42 dwellings in West Melton scheme. Engineer and Surveyor, Town Hall.

Workington. United Steel Companies are to electrify two rolling mills. Work expected to be done in next two years.

Workington. New laboratory to be built over existing building at Moss Bay works, by Workington Iron and Steel Co., Ltd.

Overseas

Syria. Agencies sought by Mr Ibrahim Dabbas of Rue Pakistan, Damascus, for U.K. manufacturers of electrical and radio equipment.

MEETINGS TO NOTE

THURSDAY, 7 JAN.

I.E.S. (Nottingham).—"Application of Fluorescent Dimming Circuits." H. H. Ballin. Elect. Offices, Smithy Row, 6 p.m.

I.E.E. (London).—Parsons Memorial Lecture on "Continuity of Electricity Supply." H. Leyburn. Savoy Place, W.C.2, 5.30 p.m.

A.S.E.E. (S. London).—"Water Heating." R. Oldroyd. Cafe Royal, Croydon, 8 p.m.

FRIDAY, 8 JAN.

I.E.S. (Birmingham).—Annual dinner at Midland Hotel.

Instn. of Mechanical Engrs.—"Experimental Investigation into Effect of Fuel Addition to Intake Air on Performance of Compression Ignition Engine," W. Y. Lyn; "Effect of Auxiliary Fuels on Smoke-limited Power Output of Diesel Engines," L. D. Derry, E. M. Dodds, E. B. Evans and D. Royle. Storey's Gate, S.W.1, 5.30 p.m.

A.S.E.E. (Liverpool).—"Some Aspects of Motor Control Gear." K. N. Swash. Engineering Soc., 9 The Temple, Dale St., 7.30 p.m.

A.S.E.E. (Stoke and Crewe).—"Industrial Lighting." P. Corry. Copeland Arms Hotel, Stoke, 7.30 p.m.

MONDAY, 11 JAN.

Leicester Electrical Soc.—"Electrically Equipped Machine Tools." W. L. Sims. Elect. Offices, Charles St., 7 p.m.

Incorp. Plant Engrs. (Dundee).—"Maintenance of Electric Motors." A. D. Christie. Mathers Hotel, 7.30 p.m.

I.E.S. (Sheffield).—"Lighting of Churches." L. C. Rettig. University, Western Bank, 6.30 p.m.

I.E.E. (N. Eastern).—"Technique and Development of Automatic Winding in Mine Shafts." B. L. Metcalf and G. Cuttle. Neville Hall, Westgate Rd., Newcastle, 6.15 p.m.

I.E.E. (S. Midland Supply and Utilisation).—"Assessment of Impregnated Pressure Cable." L. G. Brazier, D. T. Hollingsworth and A. L. Williams. Imperial Hotel, Birmingham, 6 p.m.

I.E.E. (Western).—"Design Features of Certain British Power Stations." S. D. Whetman. Elect. Offices, Colston Ave, Bristol, 6 p.m.

A.S.E.E. (Central London).—"Switchgear." K. N. Swash. St. Ermin's Hotel, Caxton St, S.W.1, 7 p.m.

TUESDAY, 12 JAN.

Newport Electric Club.—"Salvaging of Ships." Cdr. R. Walker. Tredegar Arms Hotel, 7 p.m.

Incorp. Plant Engrs. (Manchester).—"Fan Engineering." C. Gordon Huntley. Engrs. Club, Albert Sq., 7.15 p.m.

I.E.S. (London).—"Studies in Interior Lighting." J. M. Waldram. 2 Savoy Hill, W.C.2, 6 p.m.

I.E.S. (Birmingham).—"Applied Lighting." E. H. Norgrove. The Union, Birmingham Univ., Edgbaston, 6 p.m.

I.E.E. (N.W. Supply).—"Transformer-Analogue Network Analysers." H. W. Humphrey Davies and G. R. Slemon. Engrs. Club, Albert Sq., Manchester, 6.15 p.m.

I.E.E. (N. Ireland).—"Fluorescent Discharge-Tube Circuits and Operating Problems." J. Cates. Presbyterian Hostel. Howard St., Belfast, 6.15 p.m.

I.E.E. (Rugby).—"Mechanisms of Insulation Failure." H. F. Church and C. G. Garton; also "Insulation of Rotating Electrical Machinery." E. Jones. College of Technology and Arts, 6.30 p.m.

A.S.E.E. (N.W. London).—"Industrial Lighting." Rest Hotel, Kenton Lane, Kenton, 8.15 p.m.

WEDNESDAY, 13 JAN.

I.E.E. (London Radio).—"Single-Sideband Controlled-Carrier System for Aircraft Communication." G. W. Barnes. Savoy Pl, W.C.2, 5.30 p.m.

I.E.S. (Huddersfield).—"Television." C. Buckle. Elect. Offices, Market St., 7.30 p.m.

I.E.E. (N. Lancs).—"History of Television." G. R. M. Garratt and A. H. Mumford. Elect. Offices, Darwen St., Blackburn.

I.E.E. (N. Scotland).—"Street Lighting." T. L. Lappin. Caledonian Hotel, Aberdeen, 7.30 p.m.

I.E.E. (Southern).—"Electronic Speed Control of Motors." J. C. Rankin. R.A.E. Tech. College, Farnborough, 7.30 p.m.

A.S.E.E. (Bradford).—"Navigation." J. Whiteley. Midland Hotel, 7.30 p.m.

A.S.E.E. (York).—"Estimating." T. Howell. City Hotel, Kendall, 7.30 p.m.

THURSDAY, 14 JAN.

E.P.E.A. (Merseyside).—"Formation and Application of Tariffs." W. Gilchrist. Elect. Offices, Whitechapel, Liverpool, 7 p.m.

I.E.S. (Glasgow).—Presidential visit and social function.

I.E.S. (Manchester).—"Lighting for Textile Production." H. Hewitt. Textile Inst., 10 Blackfriars St, Salford.

I.E.E. (N. Midland).—"Inherent Current, Voltage and Speed Control in Dynamo-Electric Machinery." J. C. Macfarlane, J. W. Macfarlane, and W. I. Macfarlane. Elect. Offices, Ferensway, Hull, 7.15 p.m.

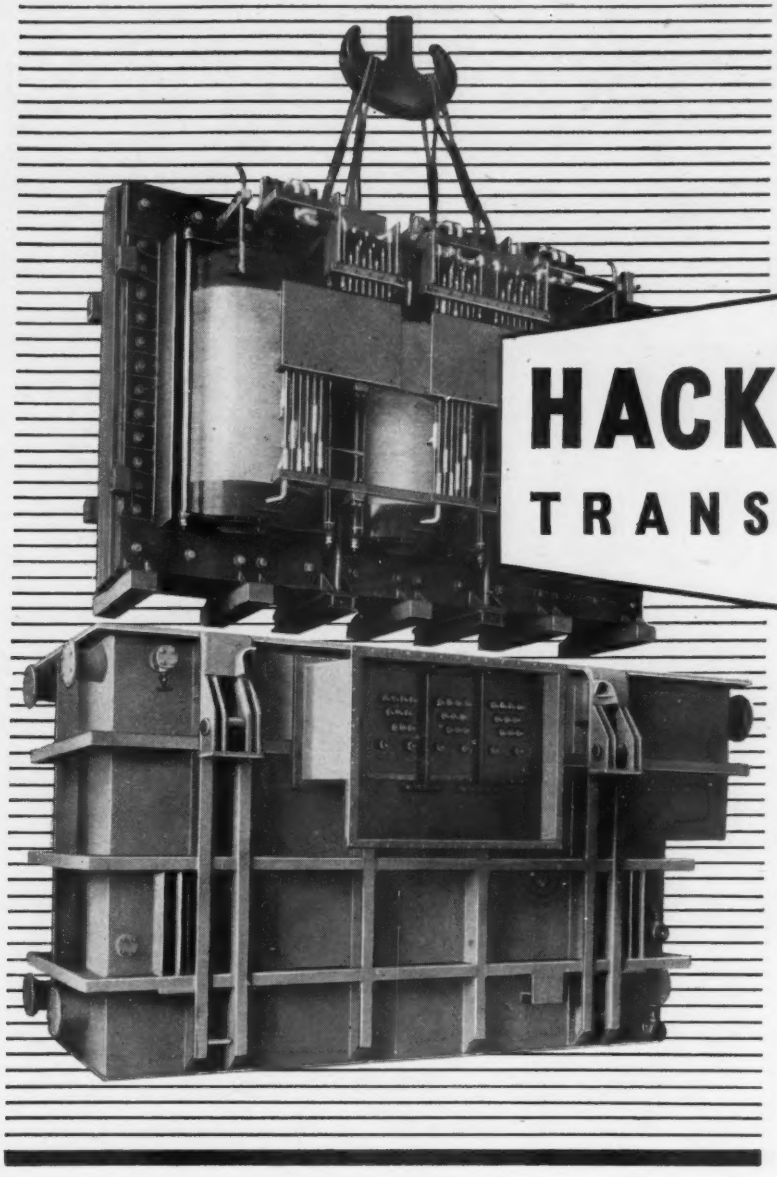
I.E.E. (N. Scotland).—"Street Lighting." T. L. Lappin. Royal Hotel, Dundee, 7 p.m.

I.E.E. (S. Midland).—"Transmission of Pictures by Radio." A. W. Cole. Winter Gdns. Restaurant, Malvern, 7.15 p.m.

FRIDAY, 15 JAN.

Instn. of Mechanical Engrs.—Thomas Lowe Gray lecture "High Temperature Steam and Gas Turbine Machinery for Marine Propulsion." T. W. F. Brown. Storey's Gate, London, S.W.1, 5.30 p.m.

I.E.S. (Edinburgh).—Annual dinner and dance at Grosvenor Hotel.



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CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

BOROUGH OF HENDON

STREET LIGHTING EQUIPMENT
LANTERNS AND COLUMNS

THE BOROUGH COUNCIL invites tenders for:

(*a*) The supply, delivery and installation of lanterns for 140 watt sodium lamps, together with transformers, condensers and other ancillary equipment, including all necessary wiring,

(*b*) The supply and delivery to site of reinforced concrete lamp standards, 25 feet to light source,

required in connection with the Improved Lighting of a section of the Hendon Way and Watford Way (A.41) (from the junction with North Circular Road to Aerodrome Road).

The form of tender, specification and bills of quantities will be issued by, and Plan No. L.74/E may be inspected at the offices of the Borough Engineer and Surveyor.

Application for the documents must be made to the Borough Engineer and Surveyor not later than Saturday 16 Jan., 1954, accompanied by a deposit of £2. 2s., in each case which will be returned on receipt of a bona fide tender on the form provided, and not subsequently withdrawn.

In the case of the accepted tender the deposit will be returned on the execution, when required, of the contract and bond; failing such execution as aforesaid the deposit will be forfeited.

The documents will be forwarded to the applicants as soon as possible after 16 Jan., 1954, and must be returned on or before Saturday, 30 Jan., 1954, in the envelope provided (suitably endorsed), which shall not bear any name or mark indicating the sender. Tenders received after this date will not receive consideration.

The Corporation does not bind itself to accept the lowest or any tender.

LEONARD WORDEN,
Town Clerk.

Town Hall,
Hendon, N.W.4. (G 268)

CITY OF BELFAST
Electricity Department

TENDERS are re-invited for the Supply, Delivery and Erection at the extension to Belfast Municipal Electric Power Station West of:

(*a*) FORM OF TENDER No. N.1277

Two 60,000 kW C.M.R. Turbo-Alternator feed heating and condensing plant sets having an economical rating of 48,000 kW and two static 72,000 kVA generator transformers. The turbines will be supplied with steam at 900 lb per sq. in. (gauge) 900°F. and the normal vacuum at 60,000 kW will be equivalent to a pressure of 1·1 in. of mercury absolute. The generator transformers are to be of the OFW type of ratio 35·4/11·8 kV.

The first turbo-alternator, feed heating and condensing plant set and the first generator transformer are required to be complete and ready for commercial service by mid-Oct., 1957, the second by 1 Dec., 1957 at the latest.

(*b*) FORM OF TENDER No. N.1380

High pressure steam, feed, drain and exhaust piping, steam receivers and all associated valves, electrical controls, fittings and all other work incidental thereto. The working steam conditions for design are 1,010 lb. per sq. in. gauge at 925°F. Pipe to pipe and pipe to valve butt-welded joints will be required together with non-destructive examination of joints. The piping which includes up to 12 in. bore is required to be designed to result in limited hot and cold thrusts on terminals, anchors and supports. The whole of the work shall be to approval.

The first section of the installation is required to be complete and ready for commercial service by mid-July, 1957, preceded by completion of items necessary for commissioning of the main plant.

Forms of Tender, Conditions of Contract and Specifications, in quintuplicate, may be obtained from Messrs Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-upon-Tyne 1; on payment of a deposit of Five Guineas in respect of each item. These deposits will be refunded provided bona fide tenders are lodged and not withdrawn. Extra copies of each of the contract documents may be obtained at One Guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Where a particular make of any equipment is called for in the Specification, the tenderer may, if he so desires, offer as an alternative similar equipment of other make approved by the Council after consultation with the Consulting Engineers.

Each Tender, in quadruplicate, in sealed envelope marked "Tender for . . . . . Electricity Committee" and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4.0 p.m. on Friday, 5 Mar., 1954.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast. (G 308)
2 Jan., 1954.

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Glascarnoch-Luichart-Torr Achilty Project Lighting, Heating and Auxiliary Cabling Installation at Luichart Dam

TENDERS are invited for the above installation. Copies of the Tender Document may be obtained on application, with cheque for one Guinea (£1. 1s.) returnable) to the Engineers, Messrs Merz and McLellan, 72a George Street, Edinburgh 2.

The Board do not bind themselves to accept the lowest or any Tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Terrace,
Edinburgh 3.
21 Dec., 1953. (G 269)

CITY OF BELFAST
Electricity Department

STORES

TENDERS are invited for the supply of the undermentioned materials:

Form No.

1. Turbine Oil.
3. Firebricks, Fireclay and Binding Cement for High Temperature Furnace requirements.
4. Spare Parts for Mechanical Stokers, Ash Conveyors and Soot Blowers.
8. Glazed Stoneware Ducts and Troughing, Fibre Ducts and Covering Tiles.
9. Feeder, Section and Street Lighting Control Pillars.
13. Time Switches.
15. Distribution Transformers.
17. Thermostats for Domestic Electric Cookers.
18. Electric Washboilers.
19. Electric Kettles.
21. Electric Cookers.
22. Bare Hard Drawn H.C. Copper Conductors and P.B.J. Insulated Cables.
24. Transformer Kiosks with High and Low Tension Switchgear.
28. Bitite Strip, Prepared Tape and Rubber Tape for Joints, Joint Box Compounds and Refined Bitumen.
31. Oilskin Coats, Tarpaulins, Rubber Jointings, etc.
36. Electric Cooker Circuit Accessories.
37. Boiling Plates for Electric Cookers.

Note: Form No. 31 is in respect of materials which shall be supplied to any Department of the Corporation.

Forms of Tender may be obtained at the Electricity Department, East Bridge St, Belfast, on payment of a fee of Ten Shillings (non-returnable) for each form. Extra copies of the forms may be obtained at Five Shillings each (non-returnable). Cheques should be made payable to the Belfast Corporation Electricity Department. All letters, catalogues, drawings, etc., accompanying tenders must be submitted in duplicate.

Each tender in sealed envelope marked "Tender for Stores, Electricity Committee" and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 29 Jan., 1954.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
2 Jan., 1954. (G 307)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions at Meaford "A" Power Station. N.J.B. service conditions, superannuable appointments, salaries within Schedule "A" of the Agreement:

(*a*) ASSISTANT SHIFT CHARGE ENGINEER, Grade G9, commencing at £641 per annum.

(*b*) STATION SHIFT CONTROL ENGINEER, Grade G10, commencing at £608 per annum.

Applicants should have had sound technical training and practical experience, in particular for (*a*) of the operation and maintenance of steam generating plant and (*b*) in the control and operation of power station plant, including main switchgear.

Apply on form AE6, quoting Vacancy No. (*a*) 575MD and (*b*) 576MD, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 23 Jan., 1954. (G 294)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division.

DRAUGHTSMEN
Construction Department
SECTION LEADER
Civil Engineering Design
Vacancy No. 4/54

Candidates should have experience in design and detail of heavy reinforced concrete structures, heavy foundations, retaining walls, bridges and the like. Preference will be given to candidates who are corporate members of the Institute of Civil Engineers or equivalent qualifications. Salary will be in accordance with Grade 3, £780-£884 per annum of Schedule D of the National Joint Board Agreement. The closing date for this appointment 25 Jan., 1954.

SENIOR DRAUGHTSMEN AND ENGINEERING DRAUGHTSMEN—Vacancy No. 1/54

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with official and administrative buildings. The salary will be in accordance with Grade 5 (£567—£671 per annum) or Grade 6 (£433—£567 per annum) of Schedule D of the National Joint Board Agreement.

ENGINEERING DRAUGHTSMEN (MECHANICAL)
Construction Department—Vacancy No. 2/54

Senior Draughtsmen are required in the Mechanical Section of the Construction Department at North Wilford Power Station. Candidates should have experience in one or more of the following:

(*i*) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.

(*ii*) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.

(*iii*) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary and conditions of service will be in accordance with the National Joint Board Agreement Grade 5 (£567—£671 per annum) and Grade 6 (£433—£567 per annum) of Schedule D according to experience.

ENGINEERING DRAUGHTSMEN (ELECTRICAL)
Construction Department—Vacancy No. 3/54

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. Switchgear, transformers, E.H.T. and L.T. cables; knowledge of protective gear systems would be an advantage. The salary will be in accordance with Grade 5 (£567—£671 per annum) or Grade 6 (£433—£567 per annum) of Schedule D of the National Joint Board Agreement.

DRAUGHTSMEN
Transmission Department
Vacancy No. 156/53

Draughtsmen are required in the Transmission Department at Divisional Headquarters. Although not essential, candidates should preferably have had experience in one or more of the following: Design and construction of High Voltage Sub-stations or overhead Transmission Lines and underground cable systems; Civil Engineering, Electrical Engineering, including layouts and Diagrams for H.V. transformers and Switchgear. Salary and conditions of service will be in accordance with the National Joint Board Agreement Grade 5 (£567—£671 per annum) and Grade 6 (£433—£567 per annum) of Schedule D according to experience. The closing date for this appointment will be 14 Jan., 1954.

JUNIOR ENGINEER
North Wilford Power Station
Vacancy No. 152/53

A suitable candidate will be given the opportunity to obtain operating and maintenance experience in the various sections of this large Generating Station operating at 850° F/600 lb sq in. steam conditions. The initial salary will be in accordance with Class K, Grade 15, (£545 per annum) of the National Joint Board Schedule. Preference will be given to the candidates who hold the Higher National Certificate or who are at present pursuing a course of study with the object of obtaining this or a similar qualification. The closing date for this appointment is 14 Jan., 1954.

SHIFT CHARGE ENGINEERS
Drakelow Power Station
Vacancy No. 153/53

Applications are invited from suitably qualified engineers having had operating experience with large capacity high pressure turbo-alternators and pulverised fuel fired boilers. Applicants should be in possession of technical qualifications admitting to Corporate Membership of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers. Apprenticeship at a large manufacturing works will be an advantage. Salary Class J, Grade 7 £817/852 per annum under the National Joint Board conditions of service. The closing date for this appointment is 14 Jan., 1954.

The above positions will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned by the dates stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
(G 298)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for (*a*) and Corporate Membership for post (*b*) an advantage.

(*a*) ASSISTANT ENGINEER (OPERATION)
Deptford East Generating Station

Successful candidate will be responsible for Turbine House operations and should be fully experienced in running-up, shutting-down and loading of H.P. Turbo-Alternators and ancillary equipment. Shift duties. Salary—Class J, Grade 13 = £579. 12s. p.a.

(*b*) POWER STATION SUPERINTENDENT
Grove Road Generating Station

Sound technical training with wide practical experience in Electrical and Mechanical Engineering and in Generating Station practice. Candidates must be competent works managers and good organisers and have had practical experience of negotiating and consultative committees and in the promotion of good labour relations. The officer will be responsible for the general management and operation of the Station. Salary—Class F, Grade 1 = £1,137 p.a.

Application may be made on form obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Great Portland St, W.1., and be received within 14 days of this advertisement. (G 297)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF SUB-AREA SENIOR DEMONSTRATOR
Sub-Area Consumers' Engineer's Department, Blackburn

APPLICANTS must have had a good education with training in Domestic Science, and should hold the E.A.W. Diploma. The person appointed will be required to give lectures and demonstrations on all types of domestic appliances, advise consumers on the choice of equipment, and must be capable of supervising staff and arranging the training and electrical education of new entrants up to E.A.W. Diploma Standard.

Salary Scale: £520/580 per annum. Grade 3. N.J.C. Conditions.

Applications to the Sub-Area Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee St, Blackburn, by 23 Jan., 1954. (G 280)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following superannuable positions under N.J.B. conditions in the Chemistry Department of the Division:

(*a*) FIRST ASSISTANT CHEMISTS for Hams Hall "A" and "B," Worcester and Wolverhampton Power Stations (Vacancy No. 572MD).

Applicants should preferably possess a university degree in Chemistry or A.R.I.C., but consideration will be given to those with H.N.C. in Chemistry. Power Station laboratory experience, including the analysis of fuel, water, and oil, water treatment and fuel sampling is desirable, but consideration will be given to those with good industrial laboratory experience.

Commencing salaries will be within Schedule "A," Grade 9 of the N.J.B. Agreement, £587 to £766 according to experience, qualifications and station to which appointed.

(*b*) ASSISTANT CHEMIST (Fuel) in Divisional Laboratory at Birmingham (Vacancy No. 573MD). Candidates should preferably possess a university degree. A.R.I.C. or other equivalent qualification, and should have a thorough knowledge and experience in fuel analysis, sampling, and problems appertaining to combustion.

(*c*) METALLURGICAL ASSISTANT in Divisional Laboratory at Birmingham. (Vacancy No. 574MD.) Candidates should be qualified metallurgists, possessing a sound knowledge of physical metallurgy, and metallography of both ferrous and non-ferrous metals, the properties of metals at high temperatures, and of corrosion problems. Experience in the investigation of failures will be an advantage.

The commencing salaries for (*b*) and (*c*) will be within Schedule "C," Grade 5 of the N.J.B. Agreement, £649 to £790, rising to £858.

Apply on form AE6, quoting the vacancy number, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 30 Jan., 1954. (G 295)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

STATION SHIFT CONTROL ENGINEER is required at Wolverhampton Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade E10, commencing at £555 per annum, plus £25 for load control duties.

A sound technical training is required, and experience in the control and operation of steam generating plant and main switchgear. Appropriate technical qualifications an advantage.

Apply on forms AE6, quoting Vacancy No. 570MD, to the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 23 Jan., 1954. (G 285)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

JUNIOR ENGINEERS
Vacancy No. 102/53

APPLICATIONS invited for appointment as Junior Engineers at various South Wales Power Stations. Salary in accordance with N.J.B. Agreement—minimum commencing salary £402 p.a. with scope for advancement to higher operational/maintenance posts.

H.N.C. and previous manufacturing works training essential.

Application forms obtainable from Divisional Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Rd, Gabalfa, Cardiff, should be returned by 15 Jan., 1954. (G 271)

THE ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS
maintains an EMPLOYMENT REGISTER for all supervisory and executive grades of electrical engineers and technicians.

Employers wishing to make use of this *free service* should write to the General Secretary, A.S.E.E. (Dept. ET), 54 Station Rd, New Barnet, Herts. (G 37)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

POWER STATION SUPERINTENDENT is required to take charge of Nechells "A" and "B" Power Stations. N.J.B. Service conditions, superannuable appointment, salary within Schedule "A," Class K, Grade 1, commencing at £1,404 per annum.

Candidates should have a wide experience in the operation of a large modern high pressure generating station, and should possess sound administrative ability. The possession of a university degree in engineering or corporate membership of the Institution of Electrical and/or Mechanical Engineers will be an advantage.

Apply on forms AE6, quoting Vacancy No. 569MD, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 23 Jan., 1954. (G 284)

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

THIRD ASSISTANT ENGINEER
(Distribution Design)

APPLICANTS should have technical qualifications equivalent to Corporate Membership of the Institution of Electrical Engineers. They must have had experience of construction or operation and maintenance on overhead and underground distribution systems up to and including 11 kV, and in planning and estimating Rural Development Schemes.

The successful candidate will be expected to take charge of a small section dealing entirely with planning Rural Development schemes up to the stage at which construction can commence. He will work in close co-operation with Commercial Assistants and Wayleave Officers, and be responsible for co-relating the progress of all sections of the work.

Salary—N.J.B. Class N Grade 9 £903/932 per annum.

GENERAL ASSISTANT ENGINEER
(Distribution Design)

Applicants should hold the Higher National Certificate in Electrical Engineering. Experience of planning and estimating Rural Development schemes, using overhead lines designed to BS.1320 is essential.

Candidates with experience in overhead line construction or operation and maintenance with some knowledge of instrumental survey work will be an advantage.

The successful candidate will be engaged on planning and estimating of Rural Development schemes, chiefly using overhead lines up to and including 11 kV.

Salary—N.J.B. Class N Grade 12 £744/766 per annum.

ENGINEERING DRAUGHTSMAN

Applicants should be capable of carrying out the survey work and drawing office work required in connection with the construction of overhead lines up to and including 11 kV, and will be required to supervise the work of two Recording and Cartographical draughtsmen.

Salary—N.J.B. Schedule D, Grade 6 £433/567 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 20 Jan., 1954.

No. 4 (Leeds) Sub-Area

Leeds District

ASSISTANT CONSUMERS' ENGINEER

The duties of the post will be primarily connected with the standardisation of supply in the City of Leeds.

Applicants should have had a sound training and experience in the design and layout of installations operating on single phase, two phase and three phase supplies and in the organisation of schemes for the standardisation of supply and the conversion of consumers equipment and apparatus.

Membership of the Institution of Electrical Engineers would be an advantage. Salary—N.J.B. Class J Grade 10 £680/706 p.a.

Leeds District

ASSISTANT CONSUMERS' ENGINEER
(Morley)

Applicants should have had a sound training and subsequent experience in the work of a Consumers' Engineer Department. the following matters: Negotiations with consumers requiring electricity supplies, tariffs, sales development, application of I.E.E. Wiring Regulations and other relevant regulations in testing and inspecting consumers' installations, electrical installation work. Control of staff and work-people.

Salary—N.J.B. Class J Grade 12 £596/619 per annum.

Applications. giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 20 Jan., 1954.

No. 7 (Grimsby) Sub-Area

Scunthorpe District

CONSUMERS' ENGINEER

Applicants should hold an appropriate technical qualification and should have had sound training and experience in the work of a Consumers' Department of an Electricity Undertaking. They should have had experience in negotiations with consumers requiring electricity supplies, tariffs, sales development, electrical installation work, including preparation of specifications and tenders, and the control of staff and workpeople.

Salary—N.J.B. Class F Grade 8 £635/664.

Scunthorpe District

GENERAL ASSISTANT DISTRICT ENGINEER
(Street Lighting)

Applicants should hold preferably the Higher National Certificate in Electrical Engineering or an equivalent qualification, and should have experience in the planning of street lighting extensions and be experienced in the various systems of street lighting and the operation of automatic control systems, and have experience in estimating.

Salary—N.J.B. Class F Grade 11 £548/565 per annum.

Scunthorpe District

SENIOR SERVICE CENTRE ASSISTANT

Applicants should have had previous experience in Service Centre work, including the sale of electrical appliances, Hire Purchase Agreements, handling of inquiries, etc.. and must be capable of advising Consumers on any matter relating to the use of electricity in their homes.

Salary—N.J.C Grade 2 £460/520 per annum.

Scunthorpe District

SALES REPRESENTATIVE

Applicants will be required to give advice within well defined instructions and under close supervision to both Urban and Rural Consumers in respect of new supplies and sales of domestic and agricultural equipment. They should be able to advise Consumers on all types of domestic and agricultural installations and prepare estimates in this connection. Salary—N.J.C. Grade 1 £380/470 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 20 Jan., 1954.

No. 6 (Hull) Sub-Area

GENERAL ASSISTANT ENGINEER
(Meters, Testing and Protection)

Applicants must hold the Higher National Certificate in Electrical Engineering or possess equivalent qualifications, and should have a sound practical knowledge of Meter and Instrument Technology. Some experience in the commissioning and maintenance of Protection Gear equipment will be an advantage.

Salary—N.J.B. Class J Grade 13 £552/573 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 20 Jan., 1954. (G 283)

HER MAJESTY'S COLONIAL OFFICE

ELECTRICAL ENGINEER

Public Works Department, Sarawak

DUTIES are to advise Government on electrical matters generally, to undertake the inspection and testing of electrical generation transmission distribution and consumers' installations, testing of meters, investigation of accidents, and such other duties as may be directed by the Governor under the Electricity Ordinance. Appointment is pensionable on probation in the salary scale £798 per annum—£1,512 per annum plus an expatriation allowance varying from £210 to £245 per annum point of entry depending on war service and approved experience. A substantial variable cost-of-living allowance is also payable.

Free 1st class passages are provided for the officer, his wife and up to three children under 10 years of age. Quarters are provided at low rental and leave is granted at the rate of 4 days for each month of resident service after a tour of 30-36 months.

Candidates, under 40 years of age, must have passed or be exempt from Parts A and B of the examination for Associate Membership of the Institution of Electrical Engineers. They should have served an apprenticeship in electrical engineering and have had subsequent experience in generation and distribution of electricity, both E.H.T. and L.T. overhead and underground, and in industrial and domestic electrical installations.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference No. CDE 112/24/07. Closing date for receipt of initial inquiries 30 Jan., 1954. (G 270)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

SECOND ASSISTANT DISTRICT ENGINEER
Evesham District

Worcester and District Sub-Area

Experience necessary in all branches of distribution work, including construction, operation and maintenance of high and low voltage underground and overhead distribution systems. Technical qualifications desirable. Salary £649/681 per annum (N.J.B. Grade E.7). Apply, in writing, within 14 days stating age, experience, present salary and position to Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

GENERAL ASSISTANT ENGINEER (PLANNING)

North Staffs Sub-Area Headquarters

Applicants should preferably be experienced in the equipment and layout of substations and high and low voltage networks including overhead and underground mains. Drawing office experience would be an advantage. Technical qualifications desirable. Salary £583/605 per annum (N.J.B. Grade K.13). Apply, in writing, within 14 days stating age, experience, present salary and position to Sub-Area Manager, Midlands Electricity Board, 31 Kingsway, Stoke-on-Trent.

A. STEPHENS,
Secretary.
(G 265)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SHIFT CHARGE ENGINEER is required at Nechells "B" Power Station, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule "A" Grade J7, commencing at £817 per annum. A sound technical training and practical experience of the operation and maintenance of high pressure and high temperature boilers and turbines is required; also E.H.T. Switchgear. Appropriate technical qualifications an advantage.

Apply on form AE6, quoting Vacancy No. 571MD available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 23 Jan., 1954. (G 293)

GOVERNMENT OF KUWAIT

TWO ASSISTANT ELECTRICAL ENGINEERS required for service with the Government of Kuwait, Persian Gulf, for posting to either Mains or Maintenance Sections. Applicants should hold a B.Sc. or recognised diploma in electrical engineering and should have had sound practical training in a recognised electrical manufacturer's works, or a large industrial concern. Men with practical experience in h.v. and l.v. distribution with supply companies and large industrial installations, would be preferable.

The starting consolidated salary is at the rate of £1,500 to £1,600 according to qualifications and experience. Free furnished quarters and free medical attention are provided, but married accommodation cannot be promised within one year. The first year will be probationary and, if satisfactory, home leave at the rate of two months for each complete year of service will be granted.

Applications, stating age and giving full details of qualifications and experience, should, in the first instance be addressed to the Secretary, Ewbank and Partners Limited, Engineering Consultants, 10/11 Grosvenor Place, London S.W.1. (G 241)

BRITISH ELECTRICITY AUTHORITY
South Eastern Division

SENIOR DRAUGHTSMAN (MECHANICAL)
Construction Department, Divisional Headquarters

CANDIDATES should preferably possess Higher National Certificate and have had experience in the design and layout of Power Station equipment including turbo alternators, boiler and ancillary plant, H.P. and L.P. steam and feed pipework. Schedule D, Grade 5, £567 to £671 per annum plus London Allowance.

JUNIOR ENGINEER (CHEMIST)
Kingston "B" Power Station

Applicants should have matriculated and be studying for Inter B.Sc. or Higher National Certificate. Class G, Grades 16/14 commencing at £427 per annum including London Allowance. N.J.B. conditions of service for both positions.

Written applications should be received by *either* the Establishments Officer, British Electricity Authority, Lower Ham Rd, Kingston-on-Thames *or* the Station Superintendent, Kingston "B" Power Station, Downhall Road, Kingston, according to the location of the vacancy, not later than 16 Jan., 1954. (G 296)

NORTH EASTERN ELECTRICITY BOARD
Wear Sub-Area

APPLICATIONS are invited for the post of Demonstrator or Assistant Demonstrator in the following districts—Sunderland, Durham, Hesledon (Seaham Harbour).

DEMONSTRATOR. Salary Grade I £380/£470. Annual increments of £20 up to £420; beyond £420 increments subject to certificate of competence. Applicants should have a Certificate of a recognised Domestic Science Training College and/or the E.A.W. Certificate, preferably the latter; also considerable experience as a Demonstrator or Assistant Demonstrator in the Electricity Supply Industry.

ASSISTANT DEMONSTRATOR. Salary £144/£360. Increments granted annually subject to satisfactory and competent service. Applicants should have one or other of the above recognised qualifications, but practical experience is not essential.

N.J.C. conditions of service. Applicants outside the Industry must apply to Local Employment Exchange.

Applications stating age, qualifications and experience, giving names of two referees, must reach the Secretary (Establishments), The North Eastern Electricity Supply Board, Carliol House, Newcastle-upon-Tyne, 1, within ten days of the appearance of this advertisement. (G 266)

BRITISH ELECTRICITY AUTHORITY
North Western Division

VACANCY NO. 266/53 — SHIFT CHARGE ENGINEER, Whitehaven. Salary £493/537 (A.7).

Vacany No. 281/53—STATION SHIFT CONTROL ENGINEER, Ribble. Salary £641/667.

Vacancy No. 286/53—SHIFT CHARGE ENGINEER, Rawtenstall. Salary £599/622 (C.7).

Applications to Establishments Officer, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 16 Jan. (G 279)

APPLICATIONS are invited for the posts of OVERHEAD LINESMEN to be located in the Drakelow area. Experience of 132 kV steel tower lines essential. Conditions and wages in accordance with N.J.I.C. Schedule. Applications, stating age, experience, etc., should be submitted through Ministry of Labour to Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham. Please quote Vacancy No. 157/53. (G 262)

A SALES MANAGER age 35-45 is required by a medium sized company manufacturing well-known electrical wiring accessories. North West England. Applications are invited from men with experience of the trade and ability to foster sales promotion schemes and to control existing sales force. Pension scheme in operation. Write fully giving age, previous position and salary expected to Box No. 3163, Electrical Times. (G 267)

APPLICATIONS are invited by Vacuum Oil Company, Limited, for the position of ELECTRICAL SUPERVISOR to take control of maintenance and to carry out testing on 11 kV and 3·3 kV distribution systems. Applicants should have good technical knowledge and wide practical experience of the protection and control of H.V. systems, modern switchgear, cabling, transformers, turbo-generators and large industrial machine drives. Successful applicants will be eligible for consideration in obtaining the tenancies of certain houses available to the Company. Conditions of employment include a Pension and Life Assurance Scheme and Sickness Benefit Plan. Applications giving full details and quoting reference "E.S." should be addressed to the Industrial Relations Superintendent, Vacuum Oil Company, Limited, Coryton, Essex. (G 273)

CABLE JOINTER, fully experienced in jointing cables up to 11 kV, for the Middle East. Write stating experience, and give References or names to whom we may apply, also state age to Box No. 3165, Electrical Times. (G 274)

ELECTRICAL DRAUGHTSMEN with good experience in cable, power and lighting installation layouts for heavy industrial works. Salaries in accordance with experience and ability. Staff Profit Sharing Scheme and Pension Fund after twelve months' service. Canteen facilities available. Apply, stating age and full particulars of experience in chronological order, to: The Chief Engineer, The Associated Portland Cement Manufacturers Ltd., Portland House, Tothill St, Westminster, London, S.W.1. (G 275)

ELECTRICAL ENGINEER is required by Messrs. Brandt & O'Dell, Consulting Engineers as designer for power and lighting distribution and generation in buildings. Applicants to write in the first instance giving particulars of their career and experience and salary required. Reply to Box No. 3171, Electrical Times. (G 287)

ELECTRICAL ENGINEER required for editorial staff of the Electrical Times. Previous editorial experience unnecessary, as successful applicant will be trained, but engineering qualification is essential. Age about 25.—Apply to the Editor, The Electrical Times Ltd., Sardinia House, Sardinia Street, London, W.C.2. (G 299)

ELECTRICAL ENGINEER required to deal with matters relating to the use of copper and copper alloys for electrical purposes. Candidates must be Corporate members of the Institution of Electrical Engineers and have had good practical experience, preferably including some experience of overhead lines. Commencing salary £800 per annum upwards according to qualifications, plus superannuation. Applications stating age, details of training and experience should be marked "Personal" and addressed to the General Manager, Copper Development Association, Kendals Hall, Radlett, Herts. (G 272)

ENGINEER required by Mufulira Copper Mines Limited, Northern Rhodesia to assist the electrical engineer in the technical administration of electrical system comprising turbo generators up to 30,000 kW total installed capacity, electric winders, electrolytic copper refinery, surface and underground reticulation etc. and the power supply and distribution for a small town. Applicants should be under 32 years of age and should either hold a degree in electrical engineering or be a corporate member I.E.E. Good salary, plus cost of living allowance and substantial bonus. Also pension and life assurance scheme. Outward passage paid. Write, in confidence, giving qualifications and experience to Mine Employment Department, Selection Trust Building, Mason's Ave, Coleman St, London, E.C.2. (G 281)

FOSTER TRANSFORMERS LTD., South Wimbledon, require an ASSISTANT DRAUGHTSMAN with some transformer experience. Annual bonus, in addition to generally recognised pay rates. Good working conditions in modern factory with welfare and canteen services and active sports and social club. Conveniently situated with good tube and bus services. Apply to the Personnel Officer. (G 289)

HANDLEY PAGE (READING) LTD., The Aerodrome, Woodley, Reading, have an immediate vacancy for a SENIOR AIRCRAFT ELECTRICAL DRAUGHTSMAN for work on an interesting new project. Only those who are fully experienced in all aspects of the work should apply, and for the successful applicant there will be suitable housing accommodation provided.—Please send full particulars of experience, etc., to the Personnel Officer. (G 28)

MAINTENANCE FOREMAN ELECTRICAL required by The English Electric Co., Ltd., for new factory at Stevenage, Herts. To be experienced in the installation and maintenance of electrical services in an engineering factory. House available if required for applicant from the Greater London area. Please apply in writing to The English Electric Co., Ltd., The Airport, Luton, Beds, quoting Ref. No. P.884. (G 258)

MANAGER required by large engineering company in the North of England to take complete control of department engaged in the manufacture and sale of centrifugal oil purifiers. Applicants should be technically qualified mechanical engineers preferably with knowledge of oil technology. Apply by letter giving full details of age, qualifications, experience and salary required to Box No. 3161, Electrical Times. (G 264)

PLASTIC CABLE manufacturers require REPRESENTATIVES for London, Lancashire and North of England areas. Box No. 3173, Electrical Times. (G 290)

SALES ASSISTANT, age 30/35, for technical sales work in Head Office of Electrical Insulation and Laminated Plastic Manufacturers. Preference will be given to applicants holding H.N.C. with manufacturing and commercial experience. Permanent and progressive position. Write, giving age, qualifications and previous experience to—Sales Manager, Permali Limited, 154 Bristol Rd., Gloucester. (G 301)

POWER PRODUCTION ENGINEER required for the Jamaica Public Service Company. Duties will involve the supervision of operation and maintenance of approximately 30 MW of steam power plant, 12 MW of hydro power plant and 4 MW of diesel power plant. Applicants must possess good engineering background with experience in the operation and maintenance of H.P. turbine plant and auxiliaries and also be capable of planning and programming the maintenance of the plant. Efficient operation and control of expenditure will be a major responsibility of the appointment. Experience with hydro and diesel Power Stations will be advantageous. Applicants should have held a position of at least a Deputy Station Superintendent in the U.K. Applicants must also have had a full technical training and preference will be given to those possessing recognised qualifications in electrical or mechanical engineering. A good salary will be offered to suitable applicants. The successful applicant will have to enter into a three year contract agreement. Free passage out and home will be provided for the successful applicant, also his wife and family. Leave will be granted at the rate of three months after three years service at full overseas salary. Applications in writing should, in the first place, be addressed to The Secretary, Ewbank & Partners Limited, Engineering Consultants, 10/11 Grosvenor Place, London S.W.1. (G 300)

PROGRESS IN MANUFACTURING METHODS and techniques in connection with a wide range of products from heavy power station equipment to electronic apparatus and development work on the products themselves, have led to several interesting vacancies in The English Electric Co. Ltd., Stafford, for MANUFACTURING or METHODS ENGINEERS and PRODUCT DEVELOPMENT ENGINEERS. Applications are invited from engineers working in either of these capacities and from those who have a sound background of practical experience in a manufacturing industry, at least O.N.C., and a desire to enter either of these important branches of engineering. Please write, giving full details of qualifications and experience and quoting Ref. S.A. 36, to Dept. C.P.S., 336-7, Strand, W.C.2. (G 234)

TECHNICAL ASSISTANT required for Export Sales section of West London Instrument Manufacturers. Higher National Certificate standard essential and some knowledge of languages preferable but not essential. Write giving details of age, experience, qualifications and salary required. Box No. 3169, Electrical Times. (G 282)

THE ENGLISH ELECTRIC CO., LTD., Liverpool, are seeking to recruit a professionally qualified ELECTRICAL DESIGN ENGINEER to initiate and supervise a programme for the development of flameproof switchgear and allied control and distribution equipment. Candidates must have several years experience of designing to meet B.S.229. Arrangements will be made to house the successful applicant. Write to Dept., C.P.S., 336/7, Strand, W.C.2, quoting ref: 777A. (G 288)

QUALIFIED ELECTRICAL DRAUGHTSMEN with O.N.C. or H.N.C. preferably with aircraft experience, required by The English Electric Co., Ltd. Salaries etc., according to qualifications and experience. Apply to Dept. C.P.S. 336/7 Strand, W.C.2, quoting ref. 183B. (G 263)

WANTED—for a Lode Mine in Malaya an ASSISTANT ELECTRICAL ENGINEER, age 22/24, with sound practical training and good technical knowledge in the care and maintenance of A.C. motors and switchgear. Salary Straits $400, $425 and $450 per month over a 3 year initial agreement plus cost of living allowance. Free furnished quarters and medical attention. Passage paid. Provident Fund. Applications with details of experience, and copies of references to Box No. 1069, C/o Abbott Ltd., 32 Eastcheap, London E.C.3. (G 302)

THE ENGLISH ELECTRIC CO. LTD., Stafford, requires experienced SENIOR and JUNIOR ENGINEERS fully conversant with the design of all types of rheostats and resistances for machines associated with generating plant and special industrial drives. Applicants must be capable of working from machine data. Please apply, stating age, experience and salary required and quoting Ref. 1217A to Dept., C.P.S., 336-7, Strand, W.C.2. (G 236)

THE ENGLISH ELECTRIC CO., Stafford, has interesting vacancies for ENGINEERS to assist in the preparation of comprehensive tenders and contracts for hydro-electric schemes. Applications are invited from those having experience of this type of work and also from young engineering graduates or H.N.C. holders, who have a background of practical engineering experience, preferably with a commercial bias. Please apply to Dept. C.P.S., 336-7, Strand, W.C.2, quoting Ref. 756A. (G 235)

TRAINING AND PERSONNEL OFFICER required by Igranic Electric Co., Ltd., Bedford. The man appointed will be required to take full responsibility for all apprentice training and also to act as deputy to the Personnel Manager. Applicants should be professionally qualified and have served an apprenticeship in the electrical engineering industry. Previous experience of training and personnel work desirable. Apply giving particulars of age, education, training and experience, and salary required to Group Training and Personnel officer, Metal Industries Ltd., Victoria Station House, 191 Victoria Street, London, S.W.1. (G 286)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (G 13)

ALL types Motors, Drills, Vacuum Cleaners, etc., efficiently REPAIRED or REWOUND at competitive prices. Repetition work a speciality. Quotations invited. Kingsmill Electrical, Locking Rd, Weston-super-Mare. (Telephone: W-s-M 2473.)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95, Park Lane, Leeds, 1. (G 20)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (G 17) (G 303)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete changeover installations, etc.—A.A. Electrical Co. Ltd., 67, Rothschild Rd, Chiswick Pk, W.4. Tel.: Chiswick 5105. (G 8)

MODERN electrical machinery and plant, i.e. MERCURY ARC RECTIFIERS, H.T. and L.T. SWITCHGEAR, TRANSFORMERS, etc.

Must be good,—such as you yourselves would buy.

WHITEFIELD MACHINERY AND PLANT, LTD., Cobden Street, Salford, 6. Tel. No.: PEN. 1373-4. (G 207)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1. (G 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (G 1)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling.—Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (G 2)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (G 6)

FOR SALE

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. Specification 214 or individual requirements. — Blickvac, 505 Lordship Lane, S.E.22. Tel.: Forest Hill 7089. (G 18)

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105, Chiswick 5605, 67 Rothschild Rd, W.4. (G 7)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22 (Forest Hill 2278-9). (G 3)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co.., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (G 9)

A.C.-D.C. QUARTERLY and SLOT METERS.—Brent Electrical Co., 6 Holmdale Gardens, London N.W.4. (G 5)

ALTERNATORS, 665 kVA (500 kW Revolving field ALTERNATOR by Siemens. Type 819 UR, for 5,000/3/50. Open type, with bell shields, underslung yoke, direct coupled Exciter 250 volts. Speed 333 r.p.m.

625 kVA, Revolving field ALTERNATOR by E.E.C. for 440/3/50, 4 wire supply, with direct coupled Exciter 17·5 kW 50 volts. Speed 600 r.p.m.

600 kVA, 480 kW, revolving field ALTERNATOR by E.E.C. for 400/3/50, with direct coupled Exciter Generator. Speed 600 r.p.m.

385 kVA, 308 kW, revolving field ALTERNATOR by L.D.M. for 400/3/50, 0·8 p.f., open type with direct coupled Exciter. Speed 600 r.p.m.

350 kVA, revolving field ALTERNATOR by Mather & Platt, for 400/3/50, 0·8 p.f. Open type with direct coupled Exciter. Speed 750 r.p.m.

George Cohen Sons & Co., Ltd., Wood Lane, London W.12. Tel.: Shepherds Bush 2070 and Stanningley, nr. Leeds. Tel.: Pudsey 2241. (G 304)

DON'T worry about your electricity bills. Fit 1s. slot electric meters for hotels, bed-sitters, etc. Prices from 50s.—Selectrics, Department E.T., Castle Circus House, Torquay. Tel. 7218. Trade inquiries invited. Trade discount. (G 21)

HACKBRIDGE oil-immersed TRANSFORMER, 11 kV 440 V 3-phase 50 cycles, delta-star, 750 kVA. Complete with Ferguson-Pailin type BV.4 oil-immersed circuit-breaker. For price and delivery apply: WHITEFIELD MACHINERY AND PLANT LTD., Cobden St, Salford 6. Tel. No.: PEN. 1373-4. (G 211)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (G 10)

MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Rd, Wood Green, London N.22. Tel.: BOW. 7221. (G 11)

METERS, reconditioned, all types, quarterly credit single and three-phase 3-4 wire. 2½-100 amps. Prepayment a.c.-d.c. single, dual, triple coin, fixed or variable tariff. 2½-50 amps. Delivery ex-stock, guaranteed. Free catalogue lists 200 types.—The Electric Meter Co., Castle Circus House, Torquay. (G 208)

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ONE open-type flat back d.c. SWITCHBOARD, 2,000 amperes capacity, fitted with single pole circuit-breaker, voltmeter 0-400 V, ammeter 0-3,000 amps, voltmeter fuses and single pole isolator. For price and delivery apply:
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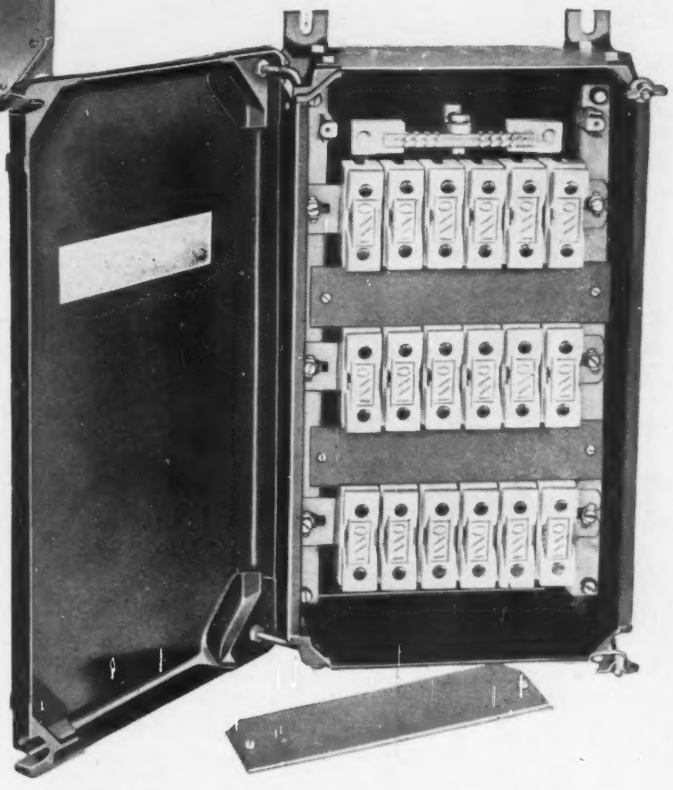

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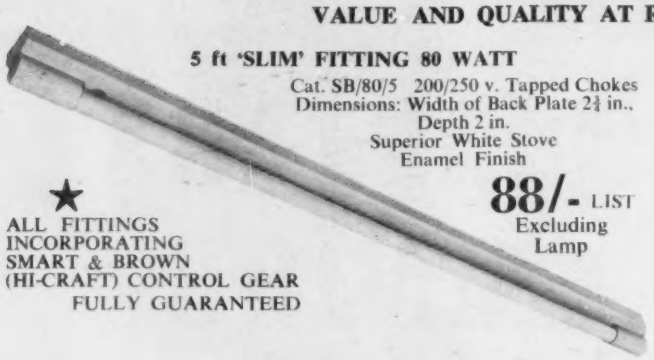

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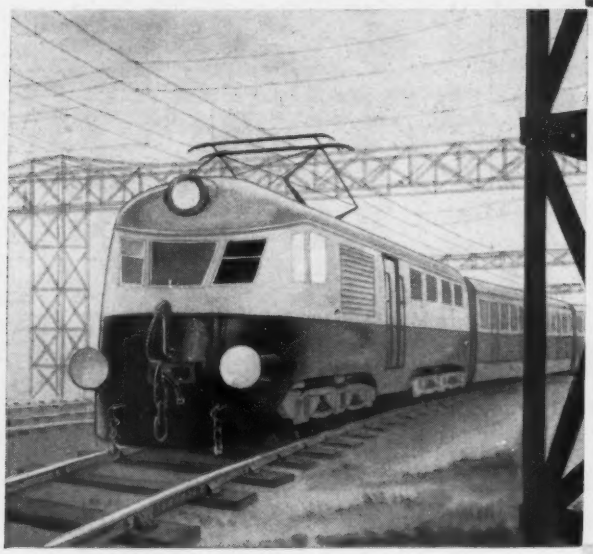

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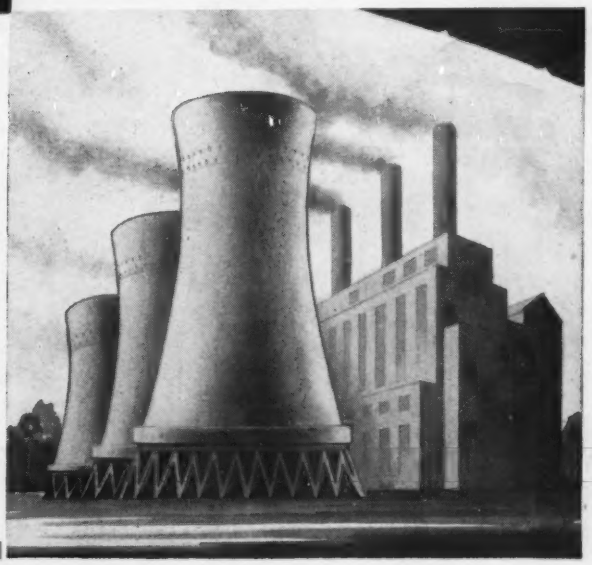

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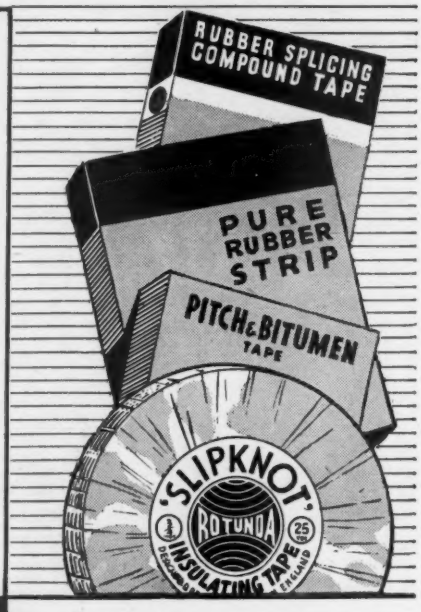

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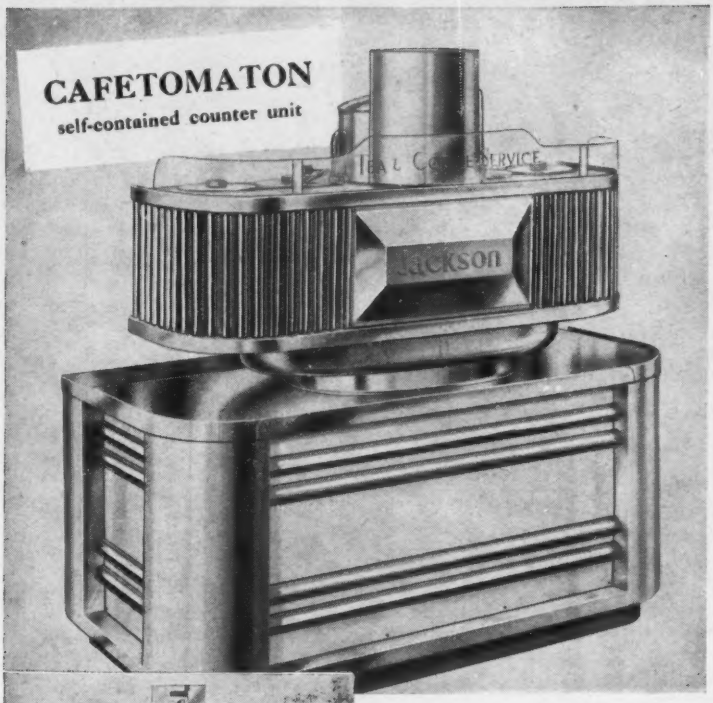

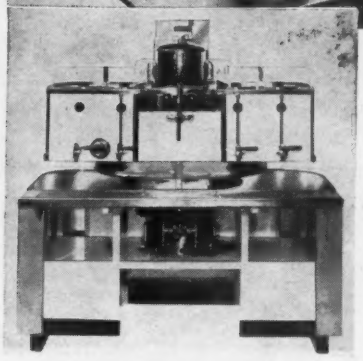

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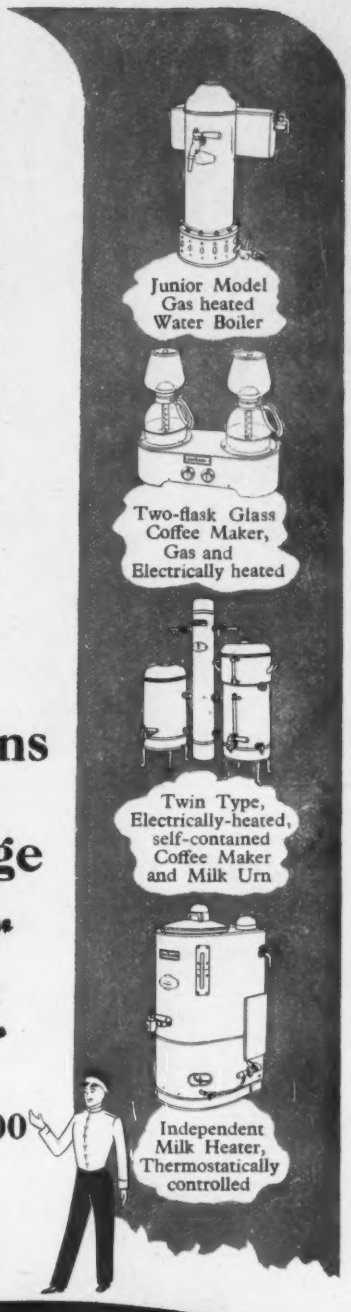
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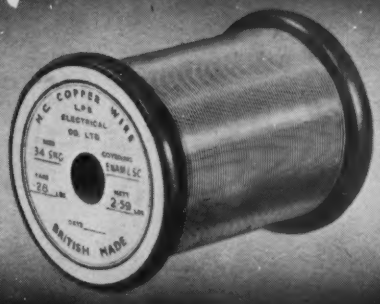

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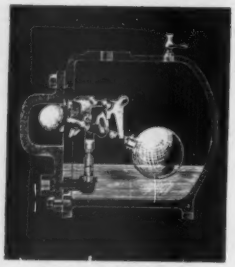

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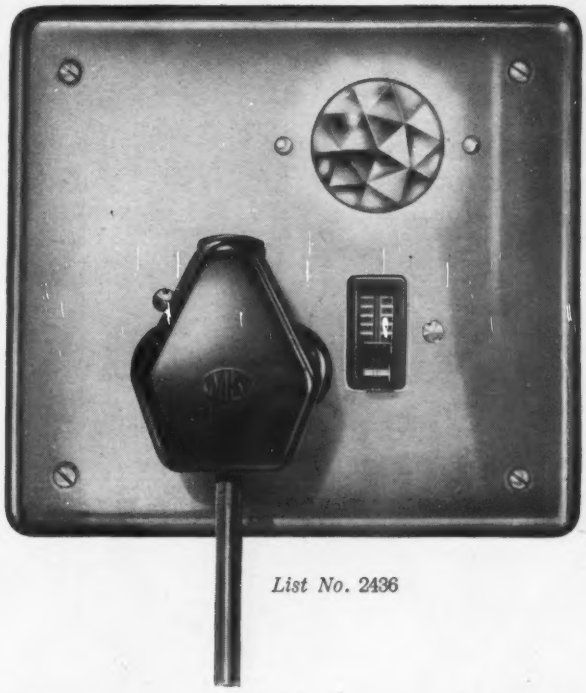

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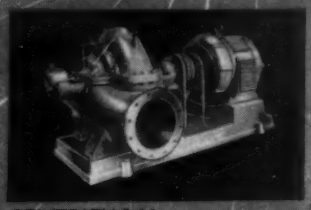

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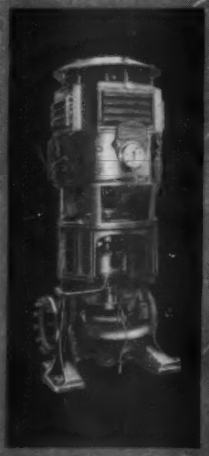

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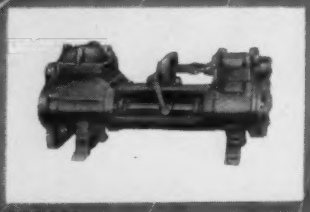

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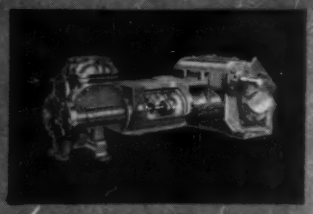

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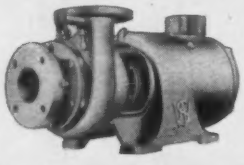

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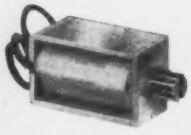

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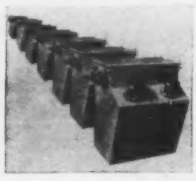

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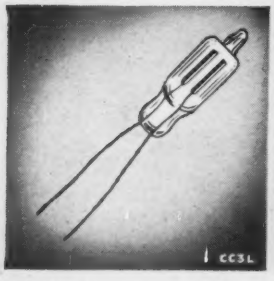

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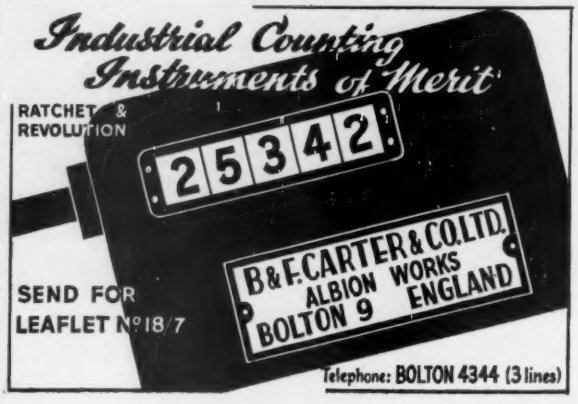

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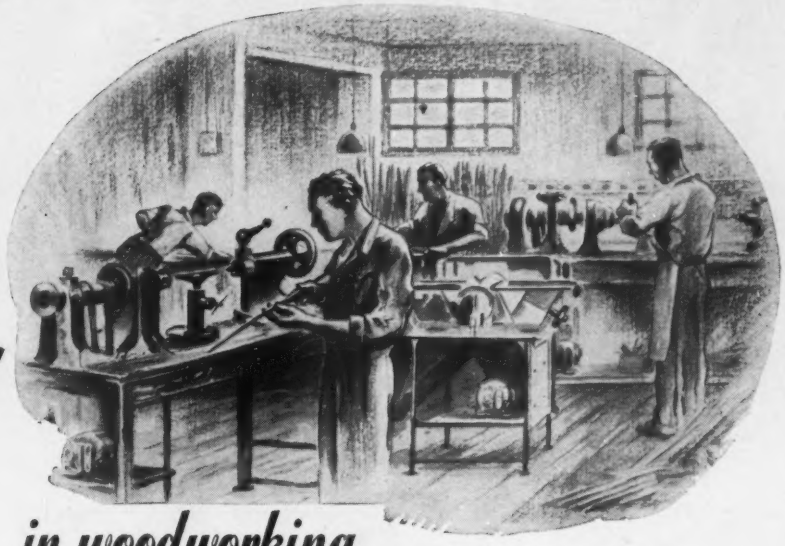

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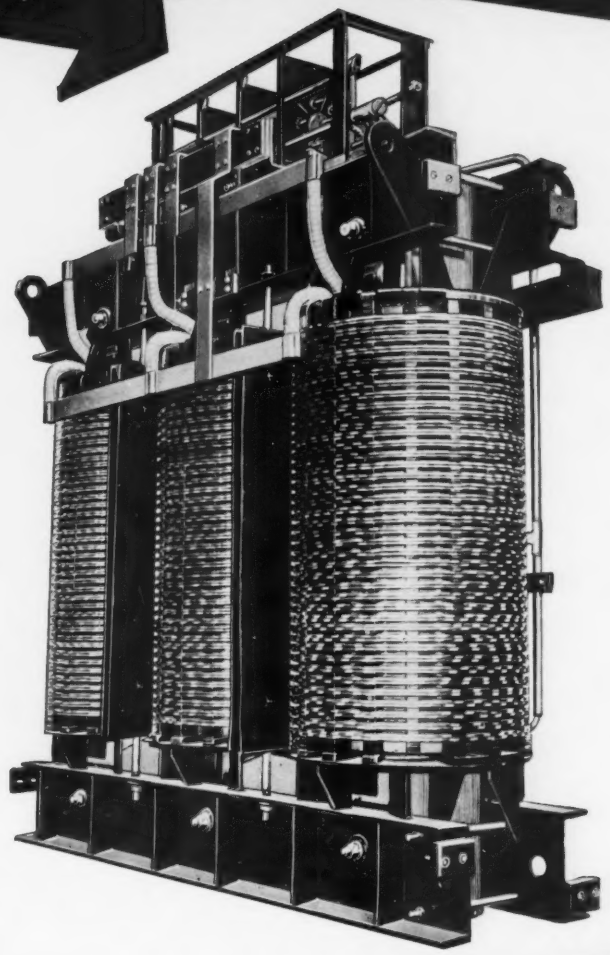

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